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AUTHOR	Pressman, Rob
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ABSTRACT

This unit is designed to show the student how to pull together information on natural and man-managed systems to develop a coherent and environmentally sound plan of action. The material includes student guide sheets, reference material, and a tape script. Audiotapes are usually used with the materials. The unit assumes the student has studied a number of previous units. (RH)

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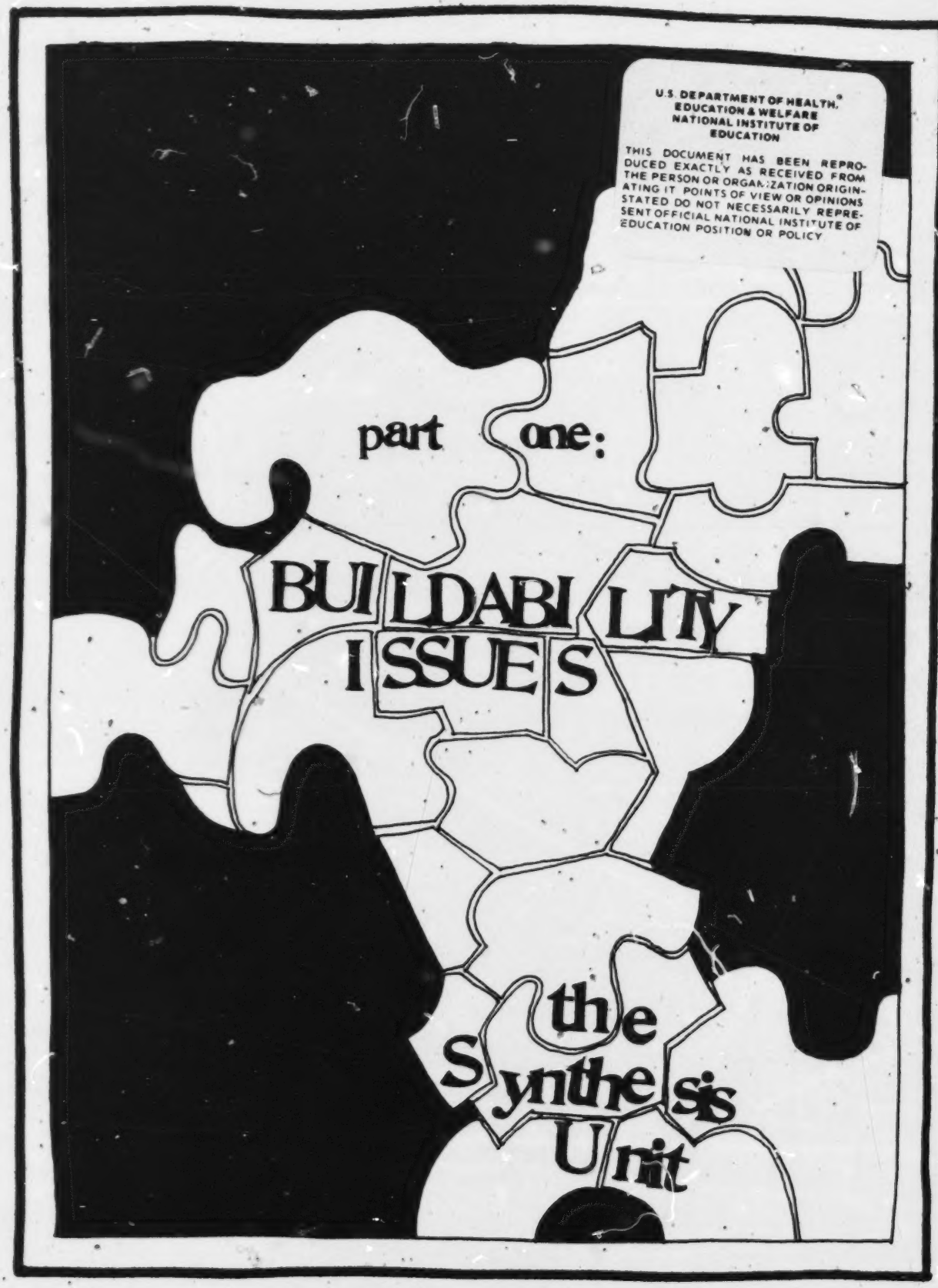

SE 021 873

SYNTHESIS: PART I

BUILDABILITY

written

and

illustrated

by

ROB PRESSMAN

GUIDE SHEET # 1

SYNTHESIS PART I: BUILDABILITY

OBJECTIVES

As population and economic growth continue to expand, land use decisions must be made that will provide for societies needs, while preserving adequate agricultural land, recreational areas and wildlife habitats. By pulling together information on natural and man managed systems, we can develop a coherent and environmentally sound plan of action.

At the conclusion of this part of the synthesis unit, you should be able to:

1. Organize buildability data on single factor overlay maps.
2. Construct composite buildability maps using the overlay technique.
3. Interpret a composite overlay map to distinguish between areas on which construction should be permitted, restricted or prohibited.
4. Analyze data on a specific site to determine whether or not the site is suitable for on site septic systems.
5. Distinguish between areas that are highly susceptible to soil erosion and areas that are minimally susceptible to soil erosion.
6. Describe procedures that can be utilized to minimize soil erosion during and following construction.
7. Integrate information on soil characteristics, slope, depth to bedrock and depth to water table in determining the bearing capacity or foundation suitability of a site.
8. Describe the impact of development of selected sites on the quality and quantity of the ground water in your community.
9. Cite evidence that reinforces the need to protect and preserve open space, vegetation and wildlife.
10. Propose reasons for development or preservation of specific land sites and provide supportive data for the position you have adopted.

This unit is of great importance, listen carefully, and carry out the activities included in this unit. By being an active participant in this unit, you stand to gain many new insights into the synthesis process of land use decision making.

BE A RECYCLER YOURSELF. WRITE YOUR COMMENTS, NOTES, AND ANSWERS ON SCRAP PAPER INSTEAD OF THESE GUIDE SHEETS. IN THIS WAY, THESE GUIDE SHEETS WILL BE AVAILABLE FOR THE NEXT PERSON IN YOUR COMMUNITY WHO WILL BE MAKING USE OF THIS UNIT.

* *

Written and Illustrated by: *ROB PRESSMAN*
Landscape Architect

Edited by: *HARRY O. HAAKONSEN*
LARRY SCHAEFER

Graphics Consultant: *ANDY MERRIELL*

Activity Consultant: *RAY HUDGENS*

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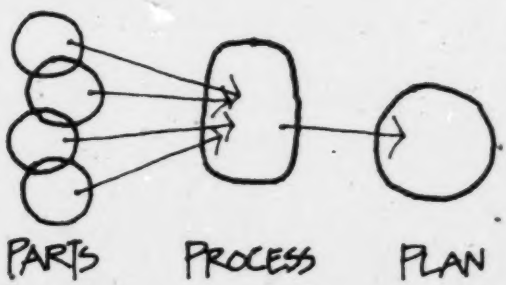
Synthesis Process



ECONOMICS

NATURAL

CULTURAL

LEGAL/
POLITICAL

ATTRACTIVENESS-
BUILDABILITY
STUDIES*

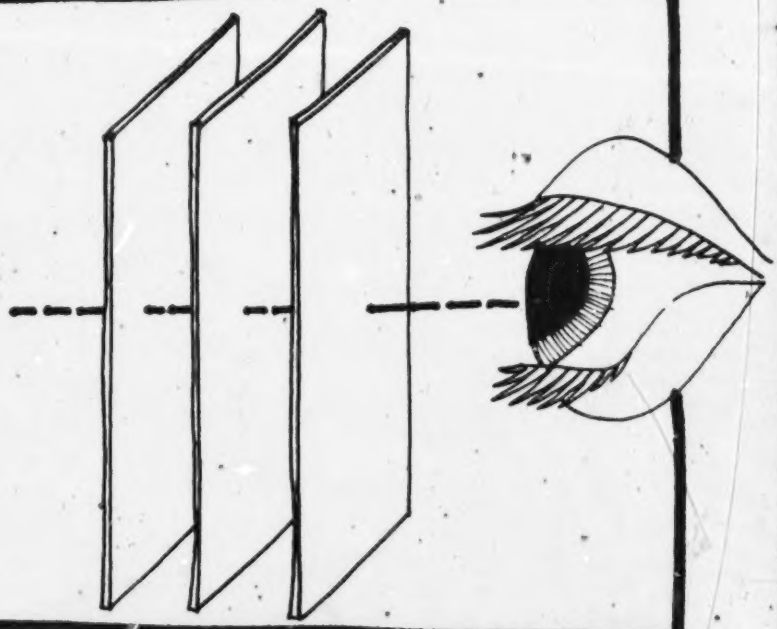
MASTER PLAN
ZONING CODE
SITE PLAN

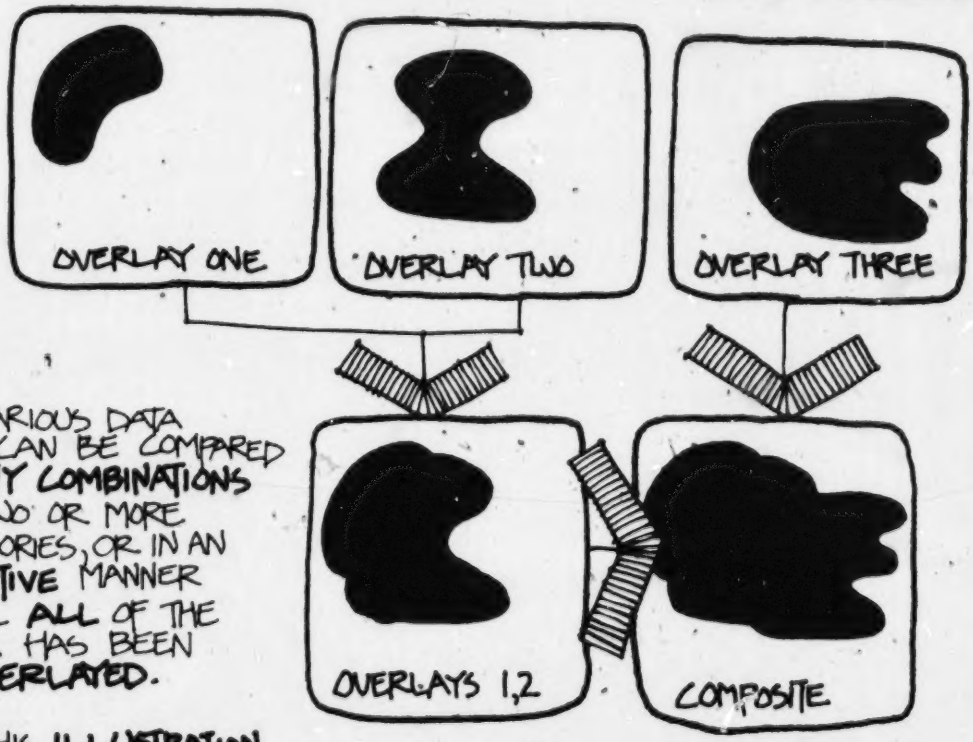
* PERFORMED BY HAND OVERLAY OR BY COMPUTER.

2

understanding: Overlays

RECORD **EACH** DATA CATEGORY ON A **SEPARATE TRANSPARENT** SHEET. **OVERLAY** THEM ON TOP OF ONE ANOTHER AND "**LOOK THROUGH**" THEM TO SEE THE **RELATIONSHIPS**.





THE VARIOUS DATA TYPES CAN BE COMPARED IN **ANY COMBINATIONS** OF TWO OR MORE CATEGORIES, OR IN AN **ADDITIVE** MANNER UNTIL **ALL** OF THE DATA HAS BEEN **OVERLAYED**.

IN THIS **ILLUSTRATION** OVERLAY ONE AND OVERLAY TWO HAVE BEEN OVERLAYED TO YIELD A **THIRD** MAP. **THIS** MAP IS THEN OVERLAYED WITH OVERLAY **THREE** TO PRODUCE A **FINAL COMPOSITE** MAP.

3

Overlay Exercise

HERE IS AN **EXERCISE** TO TEST **YOUR** UNDERSTANDING OF THE **OVERLAY** TECHNIQUE FOR RECORDING AND **SYNTHESIZING** INFORMATION. IT IS IMPORTANT FOR YOU TO BE ABLE TO **PERFORM** THESE OVERLAY OPERATIONS IN ORDER TO CARRY OUT THE **SYNTHESIS PROCESS** THAT WE DESCRIBE HERE.

WHEN YOU DO AN **ACTUAL** PLANNING STUDY FOR YOUR **TOWN** OR SITE YOU WILL OF COURSE BE DEALING WITH **REAL** NUMBERS AND **CONFIGURATIONS**. NOW WE WILL USE PURELY **ARBITRARY** FORMS WITH NO **SPECIFIC** VALUE OR SIGNIFICANCE, SIMPLY TO **PRACTICE** THE READING OF **LAYERS** OF INFORMATION AND DRAWING **COMPOSITE** MAPS.

THE **PROCEDURE** IS SIMPLE. TAKE THE SHEET LABELED **OVERLAY ONE** AND PLACE IT ON TOP OF **OVERLAY TWO**, LINING UP THE BLACK **BORDERS**. NOW PLACE A **CLEAN** ACETATE SHEET **OVER** THEM AND DRAW WHAT YOU THINK TO BE THE **SUM** OR **COMPOSITE** OF SHEETS **ONE** AND **TWO**. WHEN YOU HAVE FINISHED, TAKE OUT THE CHECK SHEET LABELED **COMPOSITE 1+2** AND MATCH YOUR ANSWER WITH THIS. IF YOU ARE **WRONG**, PERFORM THE OVERLAY **AGAIN**, MORE SLOWLY, UNTIL YOU UNDERSTAND WHAT IT WAS THAT YOU DID WRONG. IF YOU WERE **RIGHT**, **CONTINUE** ON OVERLAYING THE DIFFERENT **COMBINATIONS** OF THE THREE SAMPLE SHEETS AND **CHECKING** YOUR ANSWERS. THEN, PRODUCE THE **FINAL** COMPOSITE BY OVERLAYING **ALL** THREE SHEETS AND ONCE AGAIN CHECKING **YOUR** SOLUTION.

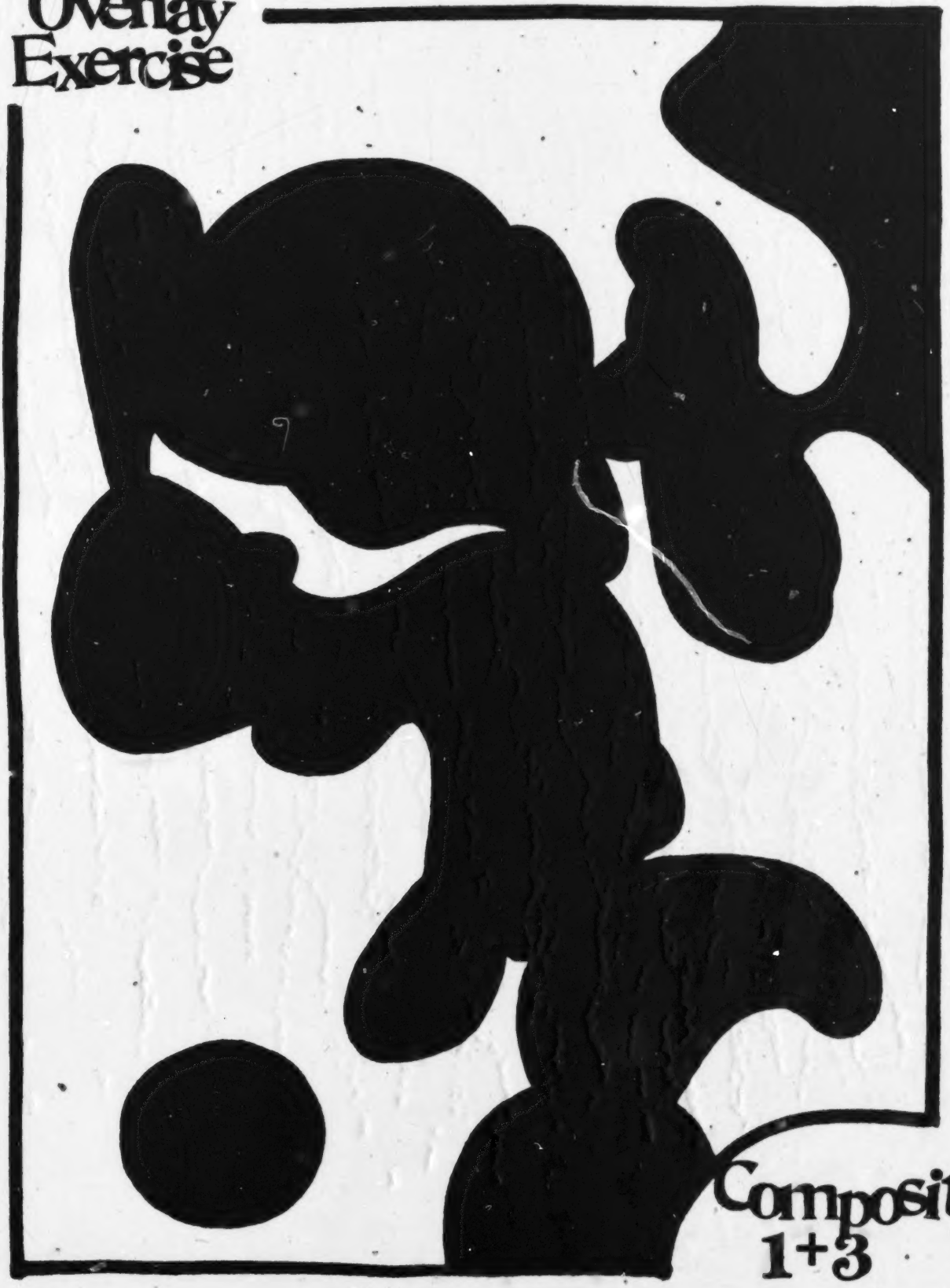
IF YOU HAVE PERFORMED **ALL** OF THESE OPERATIONS **CORRECTLY**, WE CAN ASSUME THAT YOU **UNDERSTAND** AND HAVE A **GRASP** OF THE **BASIC** OVERLAY **SKILLS**.

Instructions

Overlay Exercise

Composite 1+2

Overlay Exercise



Composite 1+3

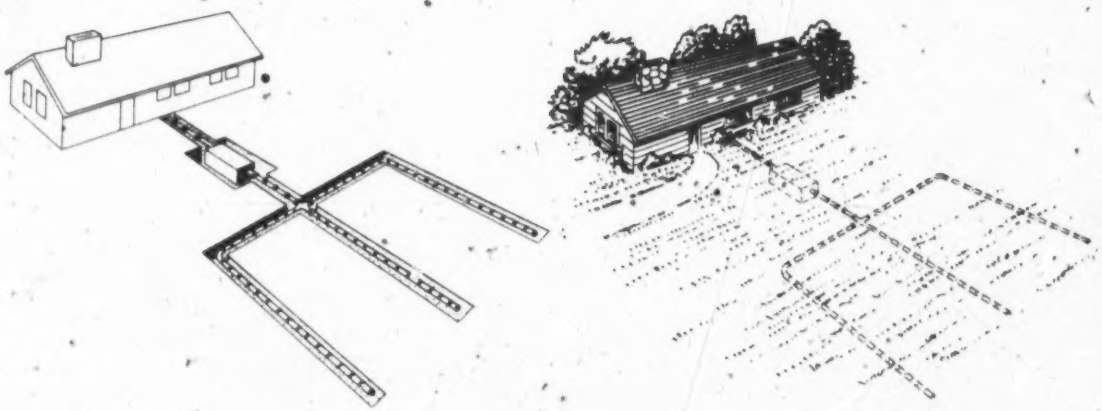
Overlay Exercise

Composite 2+3

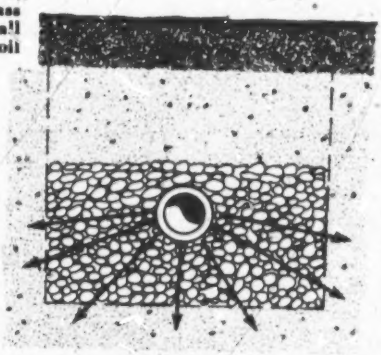
Overlay Exercise

Composite
1, 2, 3

Septic Systems

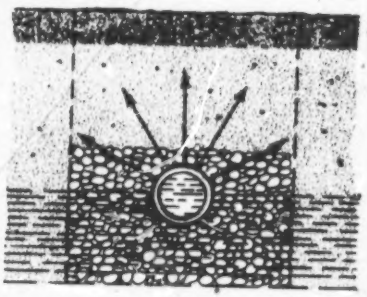


In a conventional septic-tank absorption field, draintile is laid in trenches (above, left). The tank and tile are covered with soil, and the area is planted to grass (above, right). The effluent from the tank is carried through the draintile to all points of the field where it is absorbed and filtered by the surrounding soil (right).

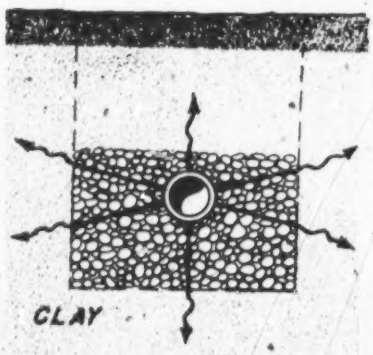


* SOURCE:
SOILS AND SEPTIC TANKS
AGRICULTURE INFO. BULLETIN
#349
SOIL CONSERVATION SERVICE

The high water table at tile level forces the effluent upward to the surface. This creates an unsanitary condition and health hazard.



HAZARDS AND PROBLEMS



Septic-tank effluent moves into compact, plastic soil very slowly. Such soils should not be used for absorption fields.

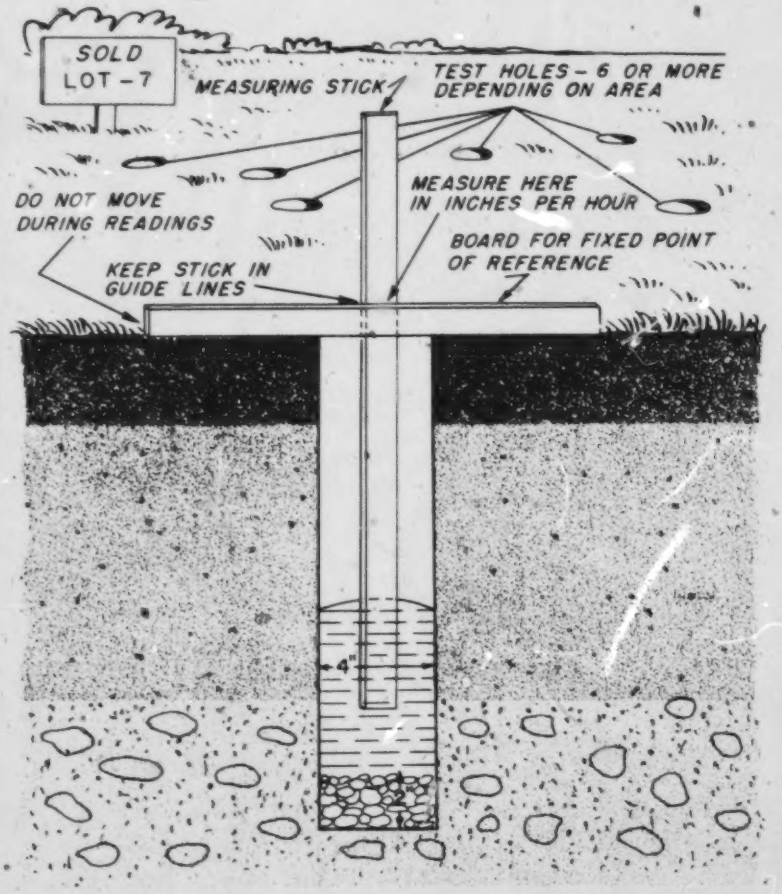
5

Percolation Tests

Percolation tests can be helpful in determining the absorption capacity of the soil and in calculating the size of the absorption field. Most local regulations require that trained personnel, generally from local health departments, make percolation tests. These tests are often made under a wide range of soil moisture conditions. Results are reliable only if the soil moisture is at or near field capacity when the test is made. Excessive percolation rates are obtained when there are small cracks or crevices in the soil because of insufficient moisture. False rates are also obtained when percolation tests are made in naturally wet soils when they are dry during periods of low rainfall and are not thoroughly moistened before testing.

Percolation tests are made as follows (*1*):

1. Dig six or more test holes 4 to 12 inches in diameter and about as deep as you plan to make the trenches or seepage bed. Space the holes uniformly over the proposed absorption field.


SOLD
LOT - 7
MEASURING STICK
TEST HOLES - 6 OR MORE DEPENDING ON AREA
MEASURE HERE IN INCHES PER HOUR
DO NOT MOVE DURING READINGS
BOARD FOR FIXED POINT OF REFERENCE
KEEP STICK IN GUIDE LINES
4"

A percolation test hole with measuring stick is shown in the foreground; other test holes properly distributed over the field are in the background.

Roughen the sides of each hole to remove any smeared or slickened surface that could interfere with water entering the soil. Remove loose dirt from the bottom of the holes and add 2 inches of sand or fine gravel to prevent sealing.

2. Pour at least 12 inches of water in each hole. Add water, as needed, to keep the water level 12 inches above the gravel for at least 4 hours or preferably overnight during dry periods. *If percolation tests are made during a dry season, the soil must be thoroughly wetted to simulate its condution during the wettest season of the year.* The results, thus, should be the same regardless of the season.

3. If water is to remain in the test holes overnight, adjust the water level to about 6 inches above the gravel. Measure the drop in water level over a 30-minute period. Multiply that by two to get inches per hour. This is the percolation rate. After getting the percolation rate for all the test holes, figure the average and use that as the percolation rate.

4. If no water remains in the test holes overnight, add water to bring the depth to 6 inches. Measure the drop in water level every 30 minutes for 4 hours. Add water as often as needed to keep it at the 6-inch level. Use the drop in water level that occurs during the final 30 minutes to calculate the percolation rate.

5. In sandy soils, where water seeps rapidly, reduce the time interval between measurements to 10 minutes, and run the test for only 1 hour. Use the drop that occurs during the final 10 minutes to calculate the percolation rate.

6. Percolation tests for seepage pits are made in the same way except that each contrasting layer of soil needs to be tested.

6

review of:

Septic tank Suitability

THE **REQUIREMENTS** FOR AN AREA TO BE **SUITABLE** ARE:

- THE **PERMEABILITY** OF THE SOIL MUST BE GREATER THAN **ONE INCH** PER HOUR.
- THE **GROUNDWATER** MUST BE AT LEAST **FOUR FEET** BELOW THE BOTTOM OF THE DRAIN TILE TRENCH.
- A MINIMUM OF **FOUR FEET** OF **WELL-DRAINED** SOIL BELOW THE DRAIN TILE TRENCH OR BEFORE A **HARDPAN LAYER** OR **BEDROCK**.
- **SLOPES** MUST BE LESS THAN **FIFTEEN PERCENT**.
- NO **STREAM** OR **WATER BODY** CAN BE WITHIN **FIFTY FEET** OF THE LEACHING FIELD.
- AN **S.L.S.** CLASSIFICATION OF **SUITABLE** FOR SEPTIC SYSTEMS.

7

mapping out:

Septic Tank Suitability

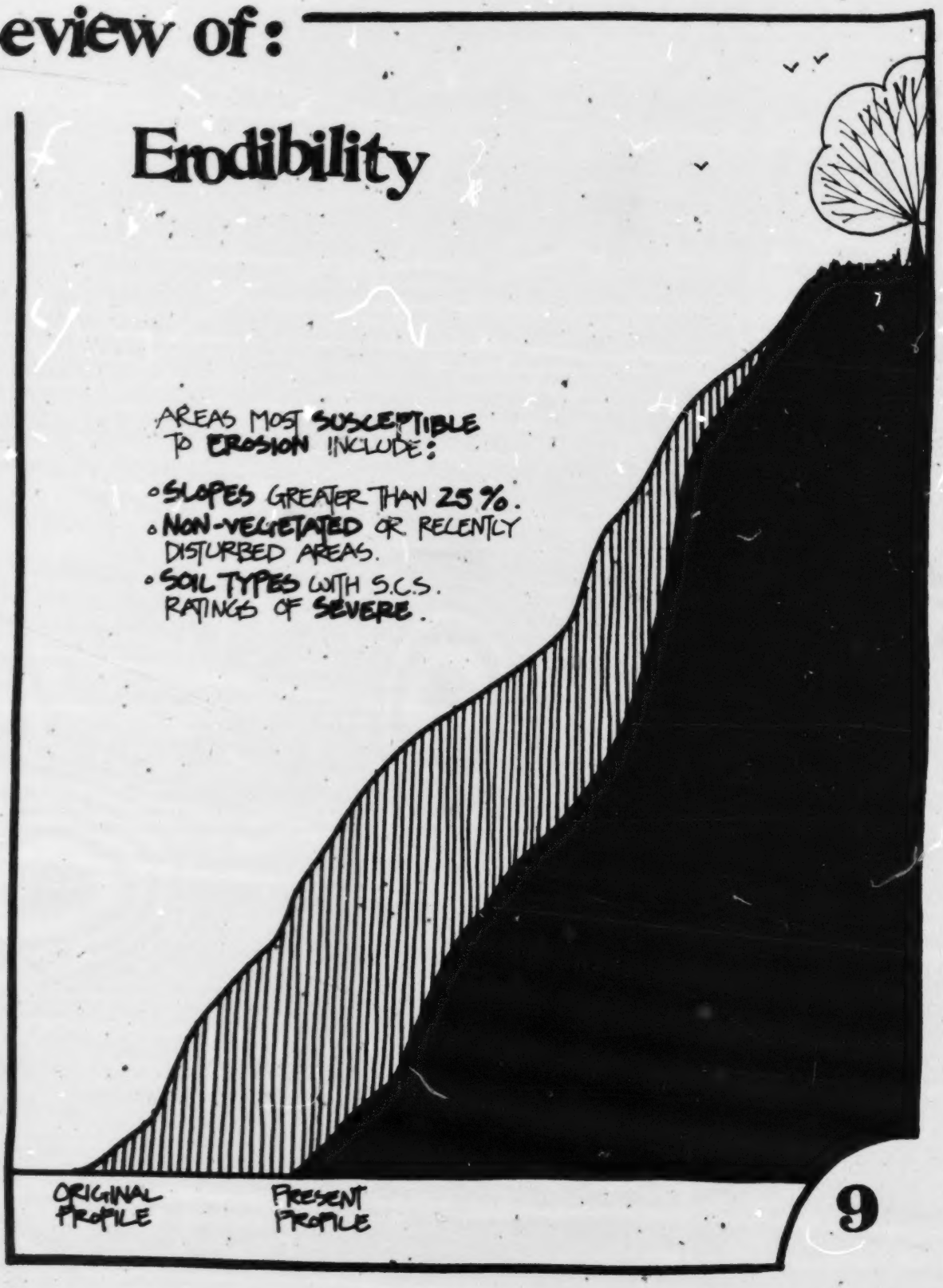
ON A MAP OF YOUR SITE OR TOWN, OVERLAY A SHEET OF TRACING PAPER OR CLEAR ACETATE, AND WITH A PENCIL OR MARKER MAP OUT THOSE AREAS THAT YOU HAVE DETERMINED TO BE UNSUITABLE FOR SEPTIC TANK SYSTEMS. BASE YOUR EVALUATIONS ON THE ISSUES DISCUSSED IN THIS SECTION, AND USE ANY SOURCES OF INFORMATION AVAILABLE IN YOUR TOWN. DO FIELD STUDIES TO CHECK YOUR INFORMATION.

* USE THE SAME COLOR OR SYMBOL FOR EACH OF THESE ZONES.

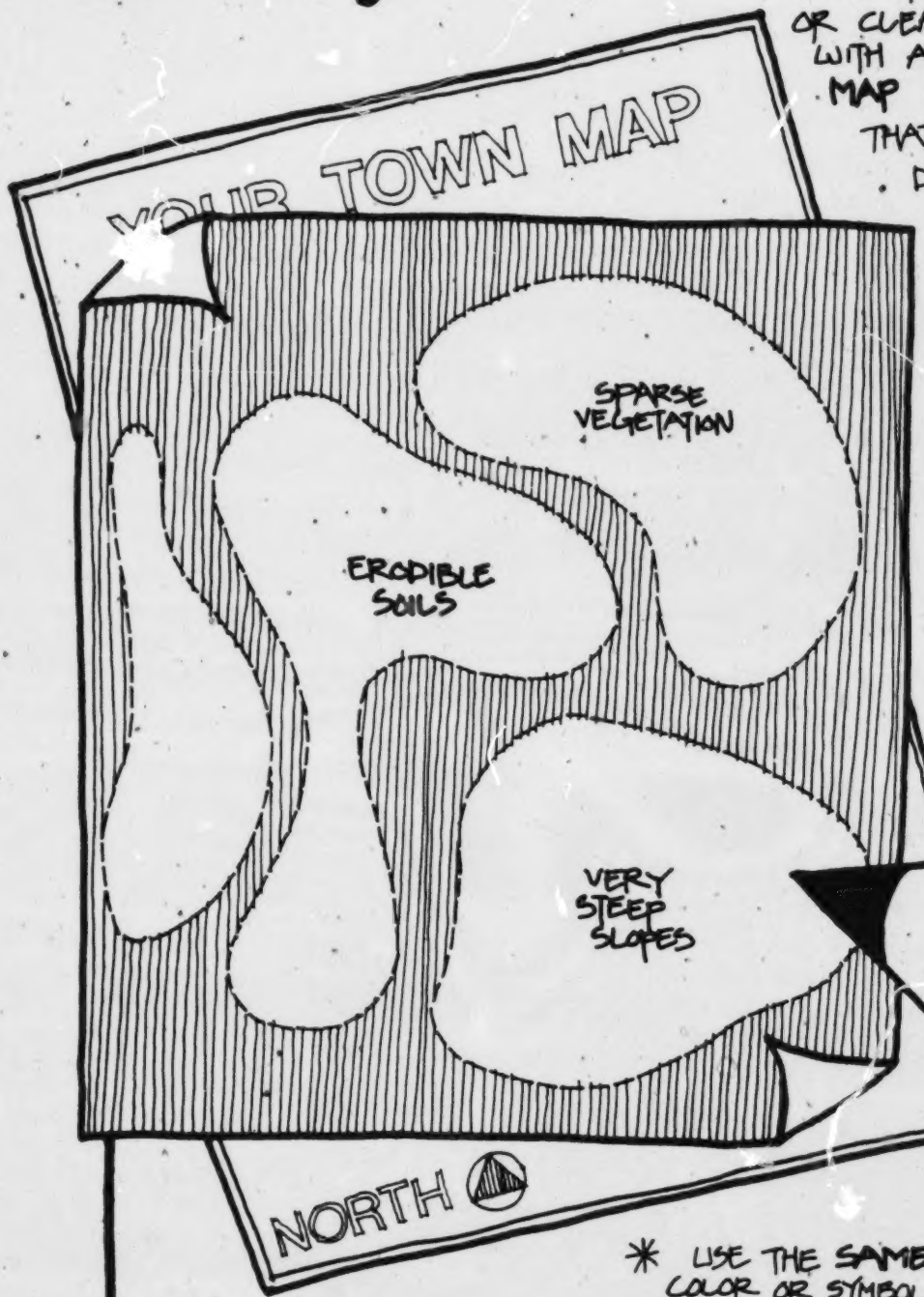
8

review of:

Erodibility


AREAS MOST SUSCEPTIBLE TO EROSION INCLUDE:
• SLOPES GREATER THAN 25%.
• NON-VEGETATED OR RELENTLY DISTURBED AREAS.
• SOIL TYPES WITH S.C.S. RATINGS OF SEVERE.
ORIGINAL PROFILE
PRESENT PROFILE
9

mapping out: Erodibility



ON A MAP OF YOUR SITE OR TOWN, OVERLAY A SHEET OF TRACING PAPER OR CLEAR ACETATE, AND WITH A PENCIL OR MARKER, MAP OUT THOSE AREAS THAT YOU HAVE DETERMINED TO BE SUSCEPTIBLE TO EROSION. BASE YOUR EVALUATIONS ON THE ISSUES DISCUSSED IN THIS SECTION, AND USE ANY SOURCES OF INFORMATION AVAILABLE IN YOUR TOWN. DO FIELD STUDIES TO CHECK YOUR INFORMATION.

* USE THE SAME COLOR OR SYMBOL FOR EACH OF THESE ZONES.

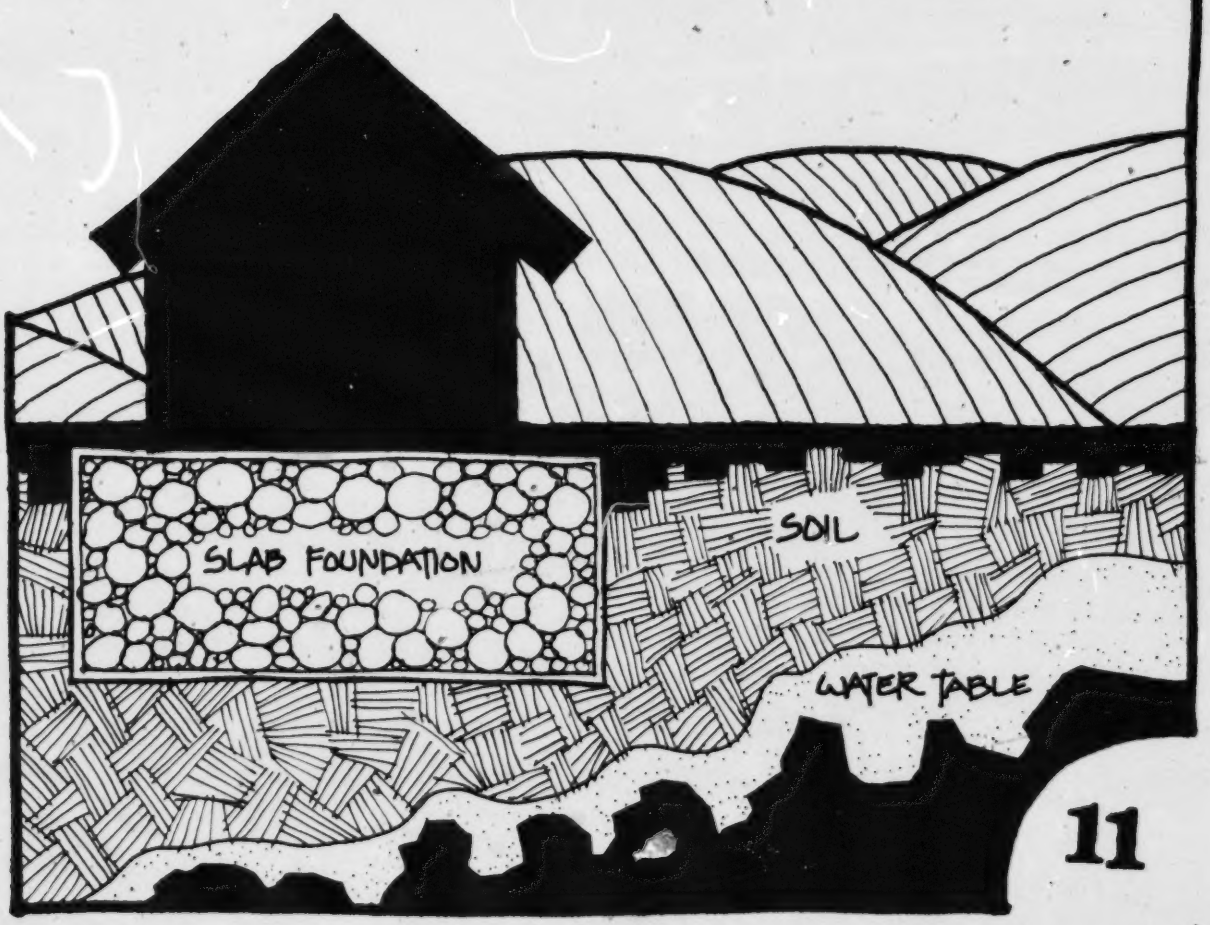
10

review of:

Foundation Suitability

SUITABLE ZONES FOR FOUNDATIONS REQUIRE:

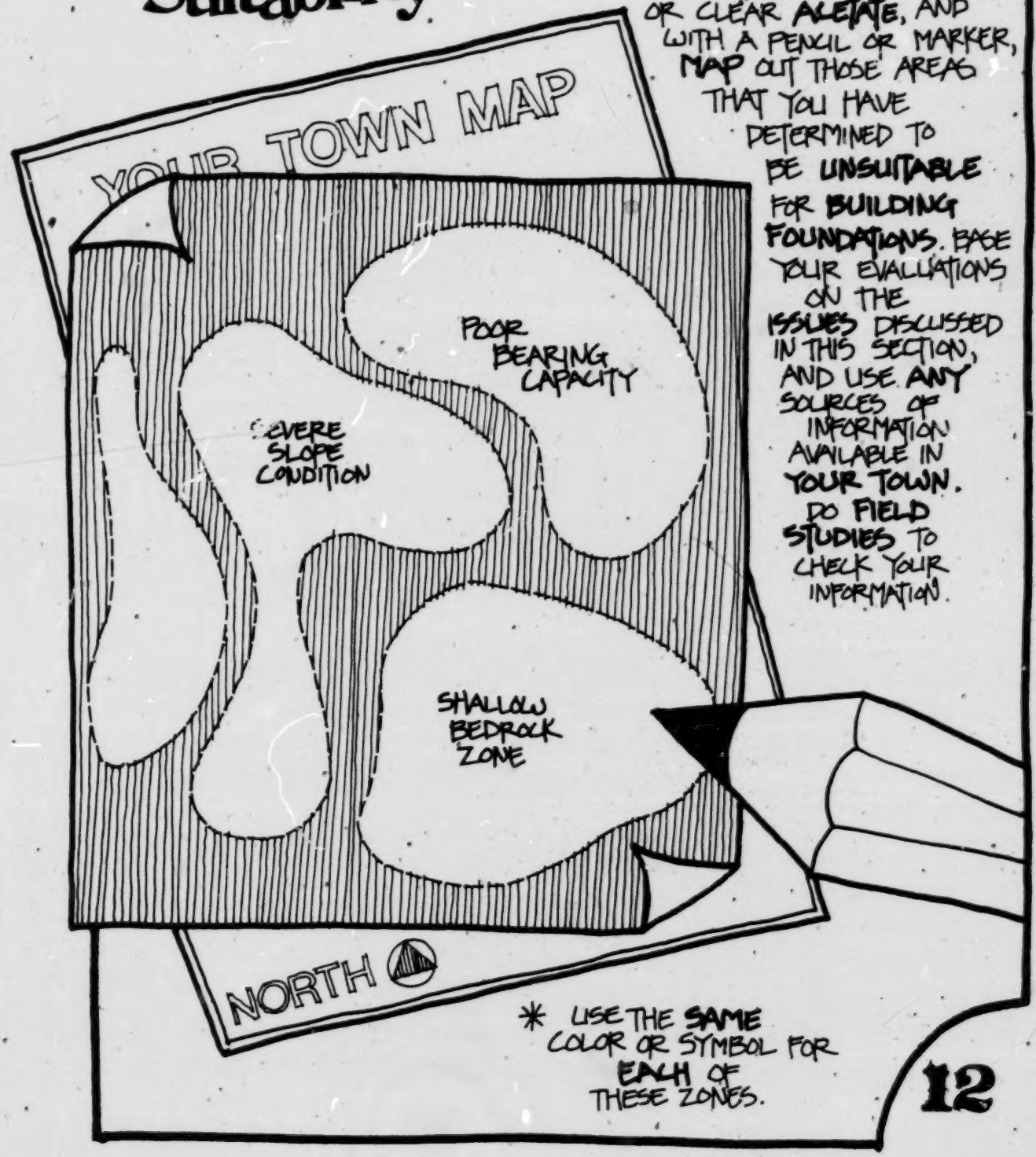
- ADEQUATE SOIL **BEARING CAPACITY**. CHECK S.C.S. MAPS.
- **WATER TABLE** SHOULD BE AT LEAST **TEN FEET** FROM THE SURFACE.
- **BEDROCK** SHOULD BE AT LEAST **TEN FEET** FROM THE SURFACE.
- **SLOPES** SHOULD BE **LESS** THAN **FIFTEEN PERCENT**. **MODERATE** LIMITATIONS ARE ENCOUNTERED ON FIFTEEN TO TWENTY PERCENT SLOPES. **SEVERE** LIMITATIONS OCCUR ON EVEN STEEPER SLOPES.



11

mapping out: Foundation Suitability

ON A MAP OF YOUR SITE OR TOWN, OVERLAY A SHEET OF TRACING PAPER OR CLEAR ACETATE, AND WITH A PENCIL OR MARKER, MAP OUT THOSE AREAS THAT YOU HAVE DETERMINED TO BE UNSUITABLE FOR BUILDING FOUNDATIONS. BASE YOUR EVALUATIONS ON THE ISSUES DISCUSSED IN THIS SECTION, AND USE ANY SOURCES OF INFORMATION AVAILABLE IN YOUR TOWN. DO FIELD STUDIES TO CHECK YOUR INFORMATION.

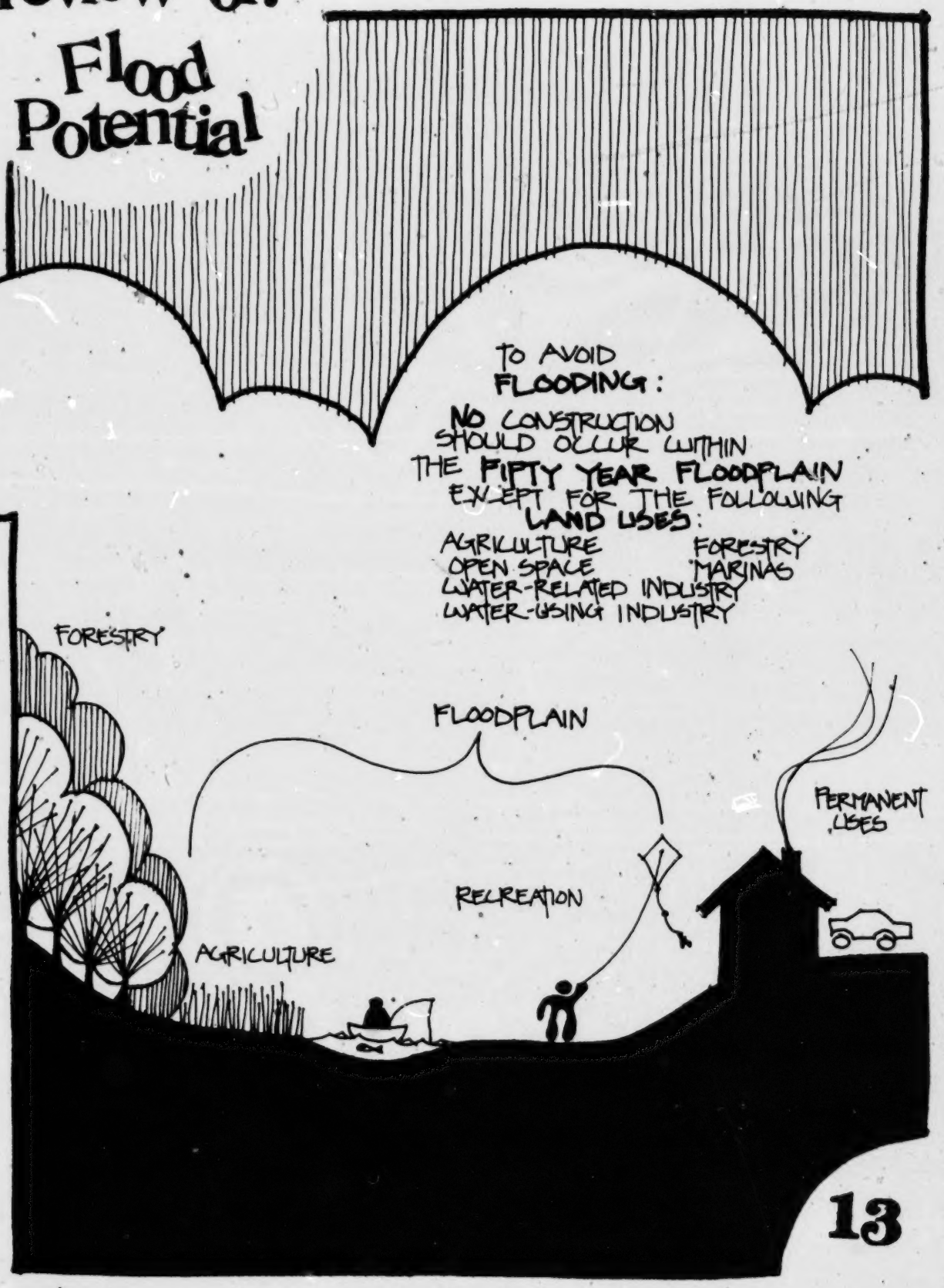


* USE THE SAME COLOR OR SYMBOL FOR EACH OF THESE ZONES.

12

review of:

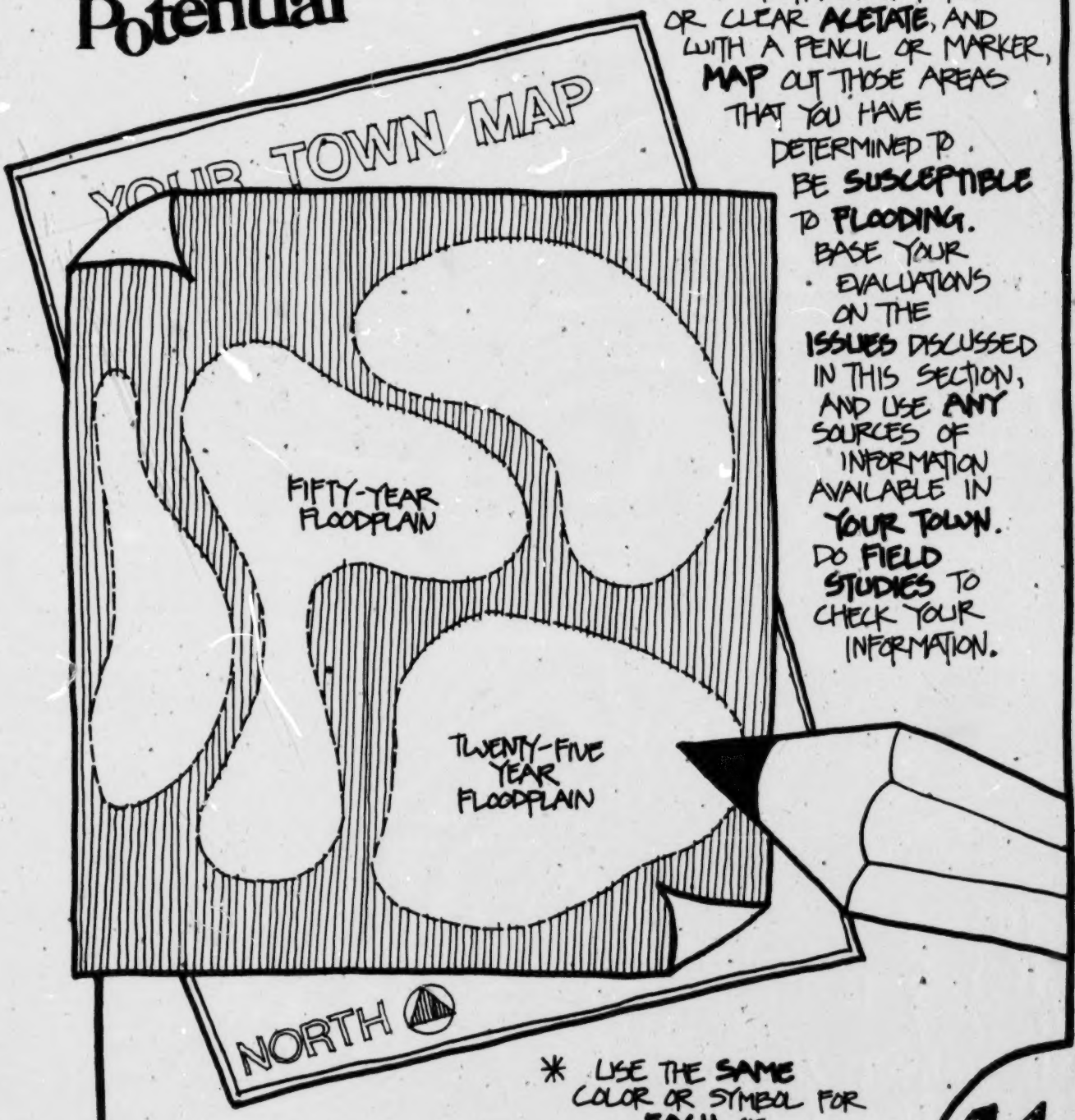
Flood Potential



mapping out:

Flood Potential

ON A **MAP** OF **YOUR** SITE OR TOWN, **OVERLAY** A SHEET OF TRACING PAPER OR CLEAR **ACETATE**, AND WITH A PENCIL OR MARKER, **MAP** OUT THOSE AREAS THAT YOU HAVE DETERMINED TO BE **SUSCEPTIBLE** TO **FLOODING**. BASE YOUR EVALUATIONS ON THE **ISSUES** DISCUSSED IN THIS SECTION, AND USE **ANY** SOURCES OF INFORMATION AVAILABLE IN **YOUR TOWN**. DO **FIELD STUDIES** TO CHECK YOUR INFORMATION.



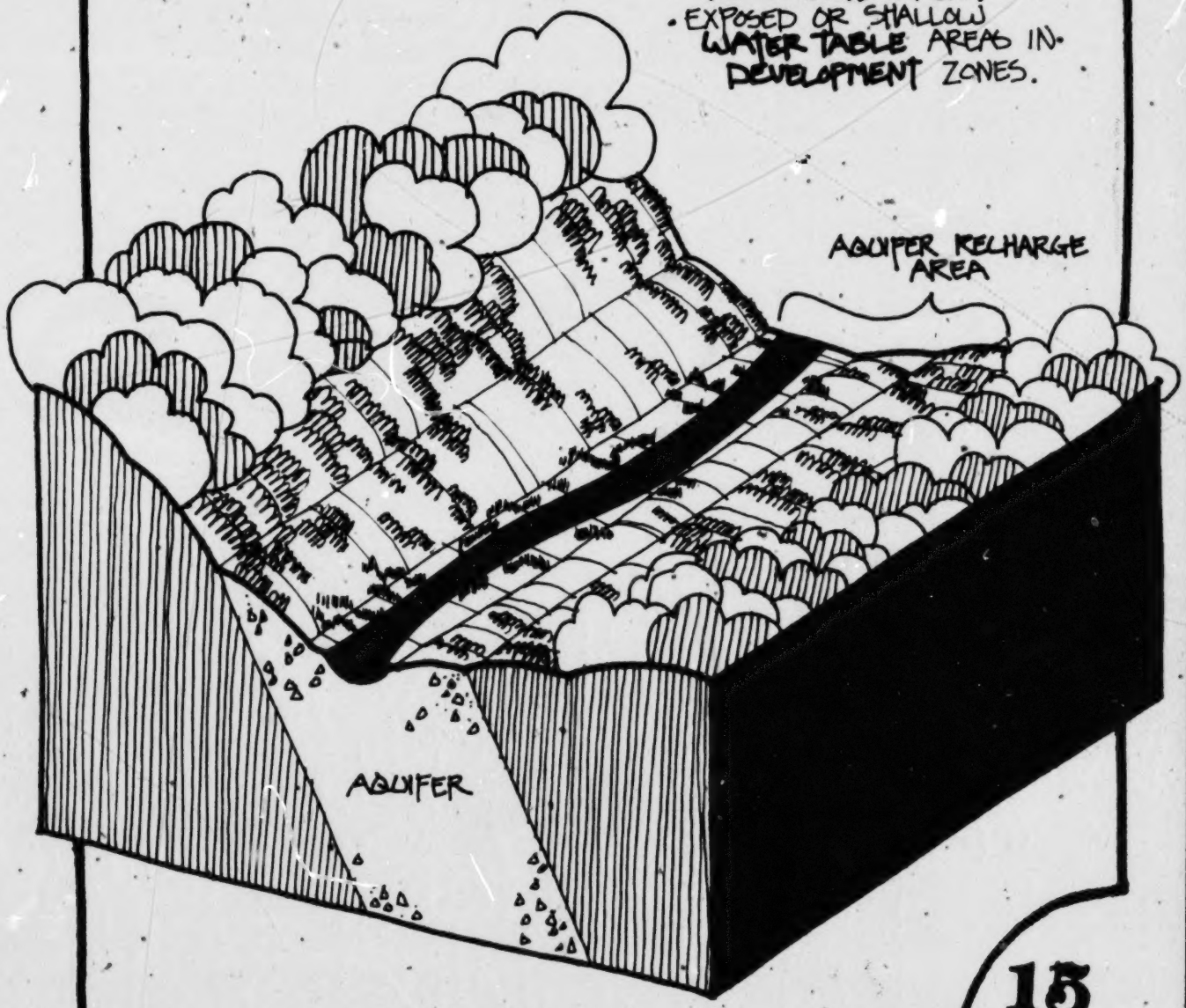
* USE THE **SAME** COLOR OR SYMBOL FOR **EACH** OF THESE ZONES.

14

review of: Groundwater Pollution

CAUSES OF GROUNDWATER POLLUTION ARE:

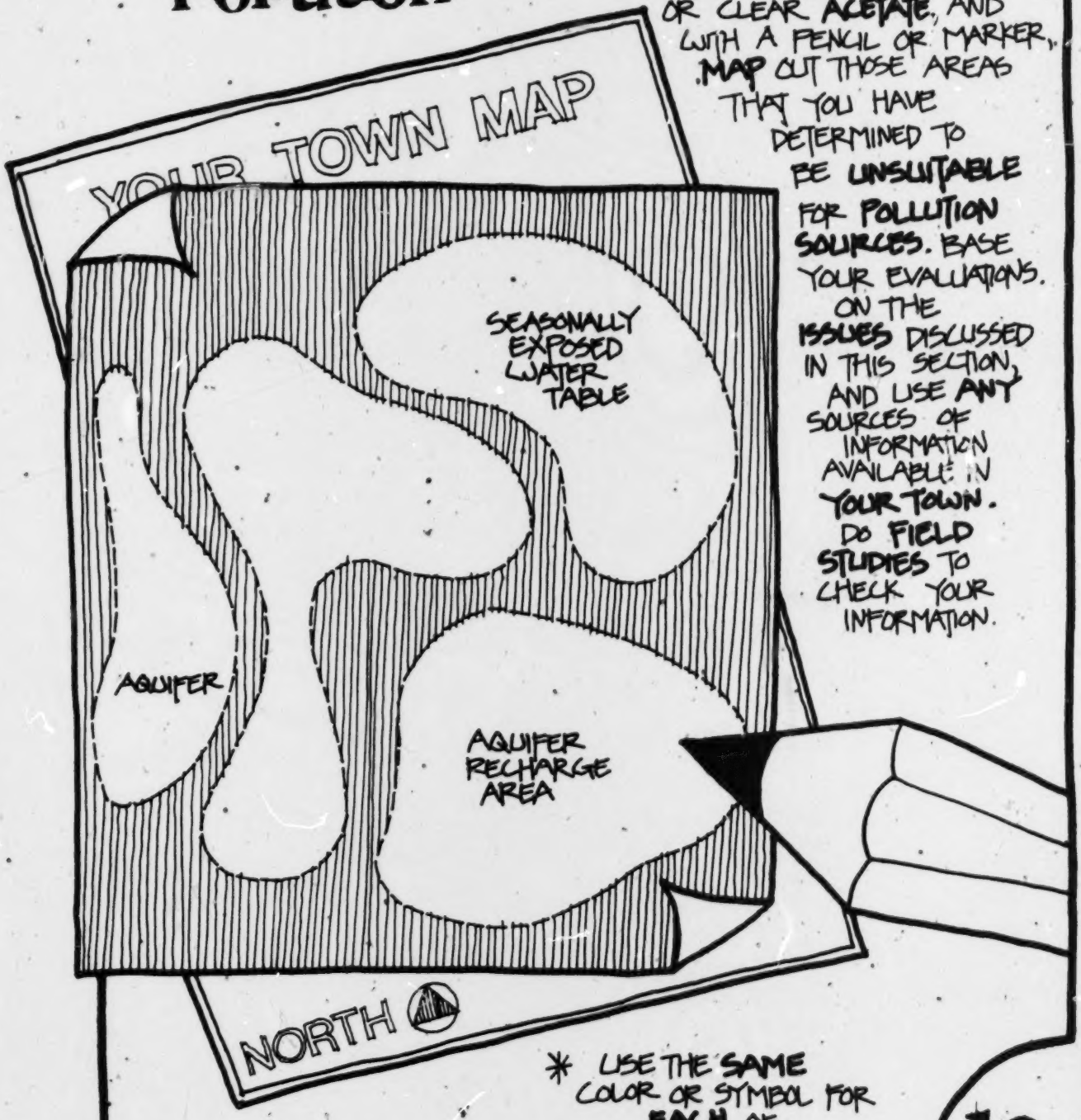
- THE IMPROPER SITING OR INSTALLATION OF SEPTIC SYSTEMS.
- A POLLUTION SOURCE WITHIN AN AQUIFER RECHARGE AREA.
- EXPOSED OR SHALLOW WATER TABLE AREAS IN DEVELOPMENT ZONES.



15

mapping out: Groundwater Pollution

ON A MAP OF YOUR SITE OR TOWN, OVERLAY A SHEET OF TRACING PAPER OR CLEAR ACETATE, AND WITH A PENCIL OR MARKER, MAP OUT THOSE AREAS THAT YOU HAVE DETERMINED TO BE UNSUITABLE FOR POLLUTION SOURCES. BASE YOUR EVALUATIONS ON THE ISSUES DISCUSSED IN THIS SECTION, AND USE ANY SOURCES OF INFORMATION AVAILABLE IN YOUR TOWN. DO FIELD STUDIES TO CHECK YOUR INFORMATION.



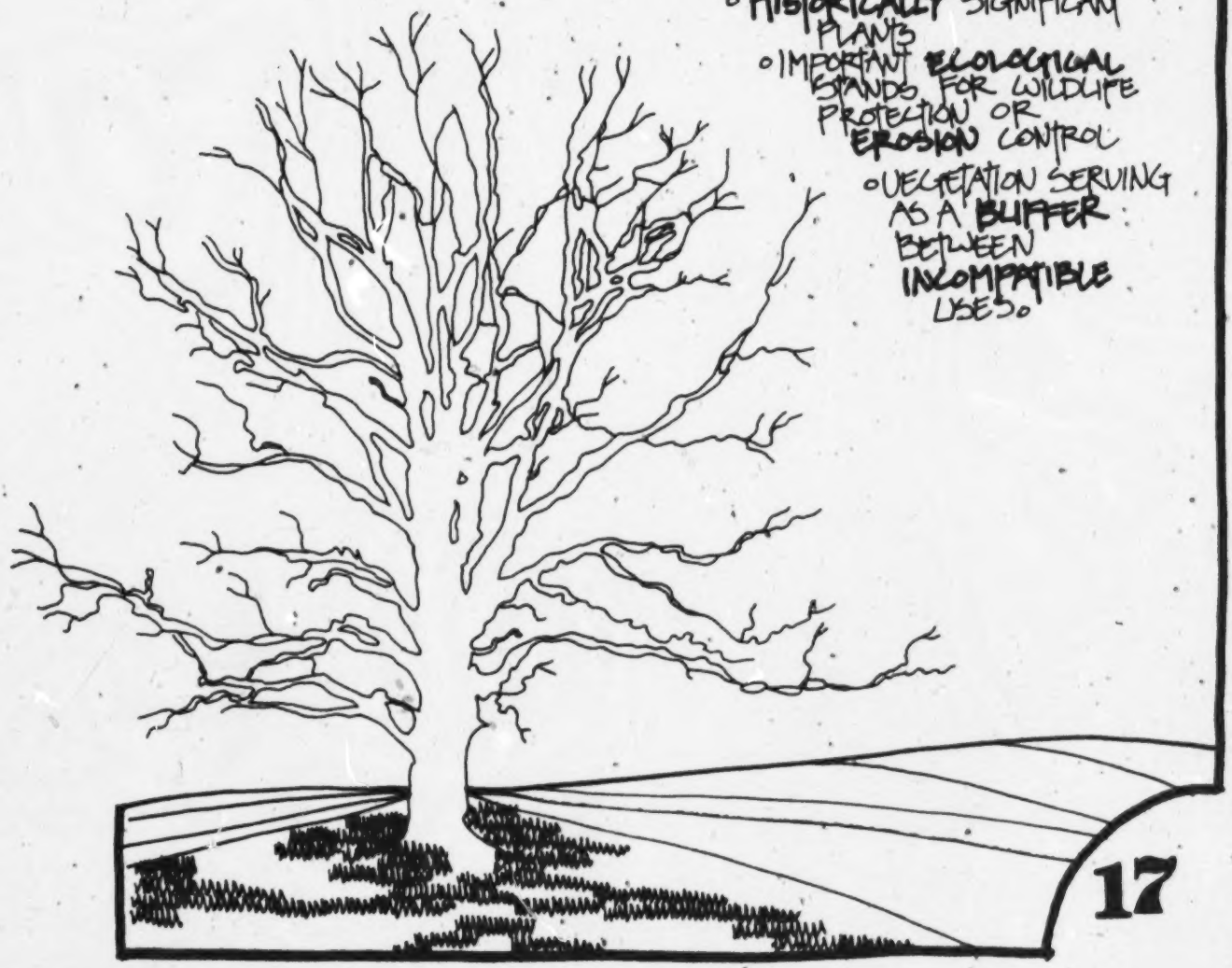
* USE THE SAME COLOR OR SYMBOL FOR EACH OF THESE ZONES.

16

review of: Vegetation

VEGETATION TO BE PRESERVED:

- ENDANGERED SPECIES
- RARE SPECIMENS
- UNUSUAL VEGETATIVE ASSOCIATIONS
- HISTORICALLY SIGNIFICANT PLANTS
- IMPORTANT ECOLOGICAL STANDS FOR WILDLIFE PROTECTION OR EROSION CONTROL
- VEGETATION SERVING AS A BUFFER BETWEEN INCOMPATIBLE USES.



17

review of Wildlife Habitats

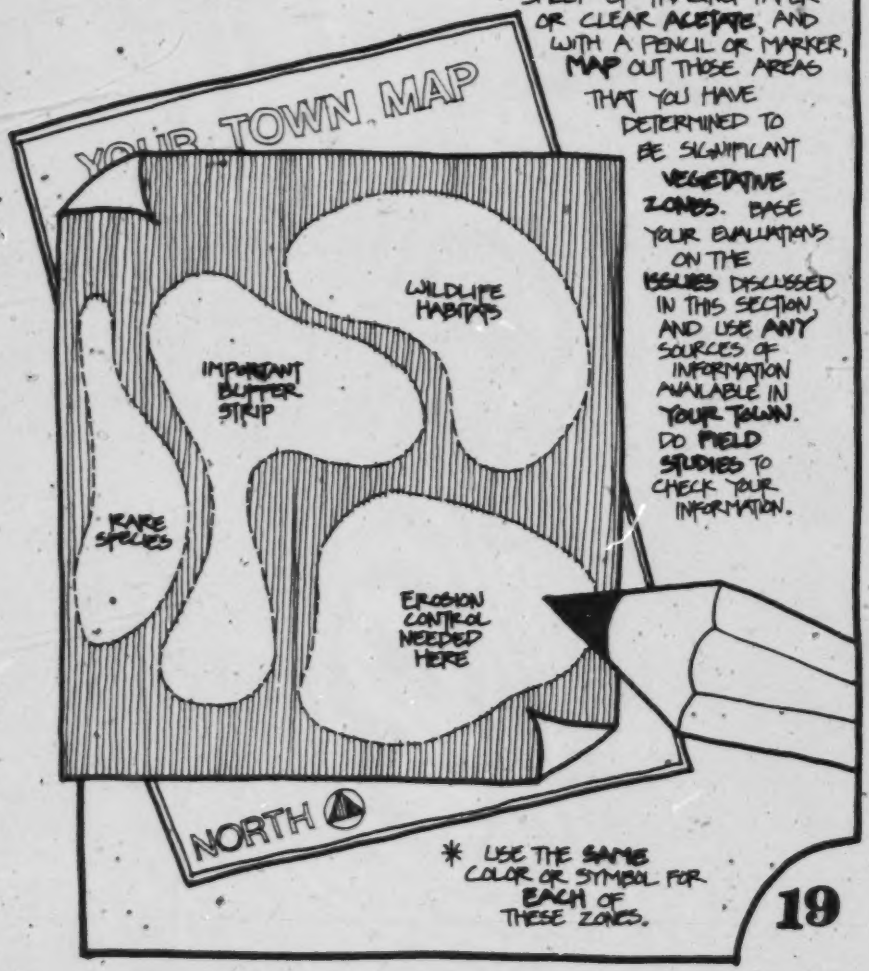
HABITATS VARY WITH EACH ANIMAL SPECIE. HABITAT CHARACTERISTICS, THEN, ARE TOO NUMEROUS TO LIST HERE. BUT THE MOST COMMONLY FOUND SPECIES INCLUDE:

DUCKS
DEER
RABBIT
MUSKRAT
SKUNK
SQUIRREL
GROUSE
CHIPMUNK
FISH
OTTER
FOX
BIRDS
SNAKES

18

mapping out: Vegetation

ON A MAP OF YOUR SITE OR TOWN, OVERLAY A SHEET OF TRACING PAPER OR CLEAR ACETATE, AND WITH A PENCIL OR MARKER, MAP OUT THOSE AREAS THAT YOU HAVE DETERMINED TO BE SIGNIFICANT VEGETATIVE ZONES. BASE YOUR EVALUATIONS ON THE ISSUES DISCUSSED IN THIS SECTION, AND USE ANY SOURCES OF INFORMATION AVAILABLE IN YOUR TOWN. DO FIELD STUDIES TO CHECK YOUR INFORMATION.

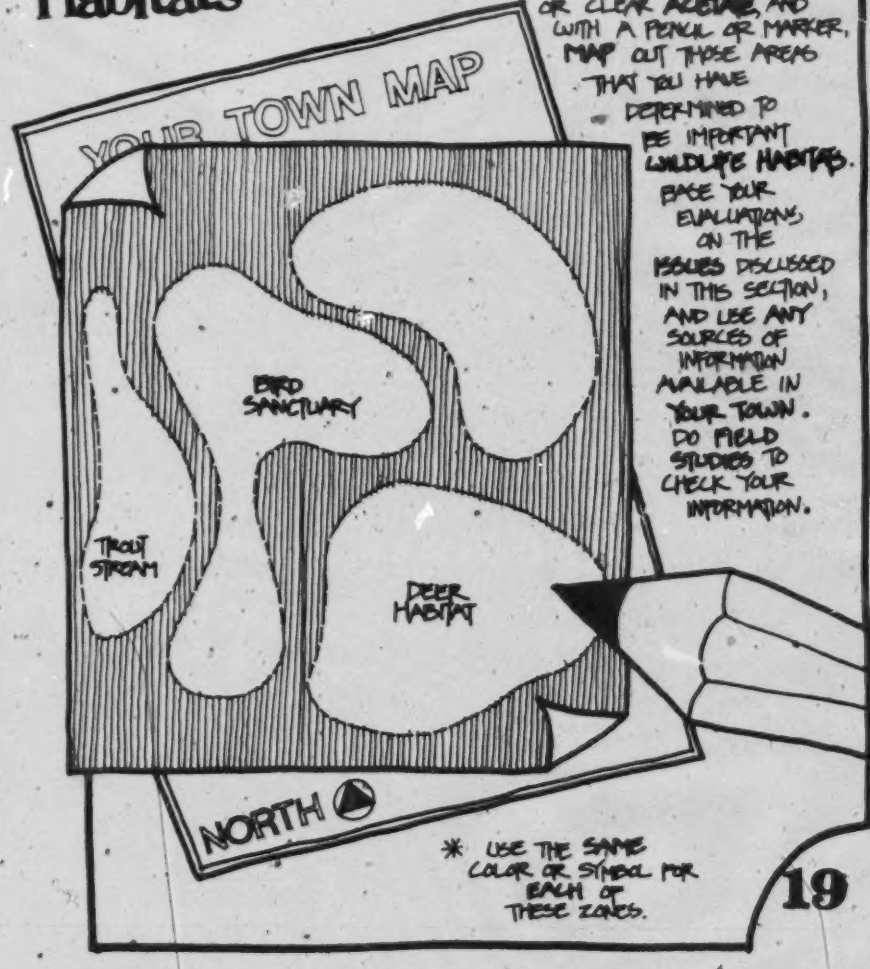


* USE THE SAME COLOR OR SYMBOL FOR EACH OF THESE ZONES.

19

mapping out: Wildlife Habitats

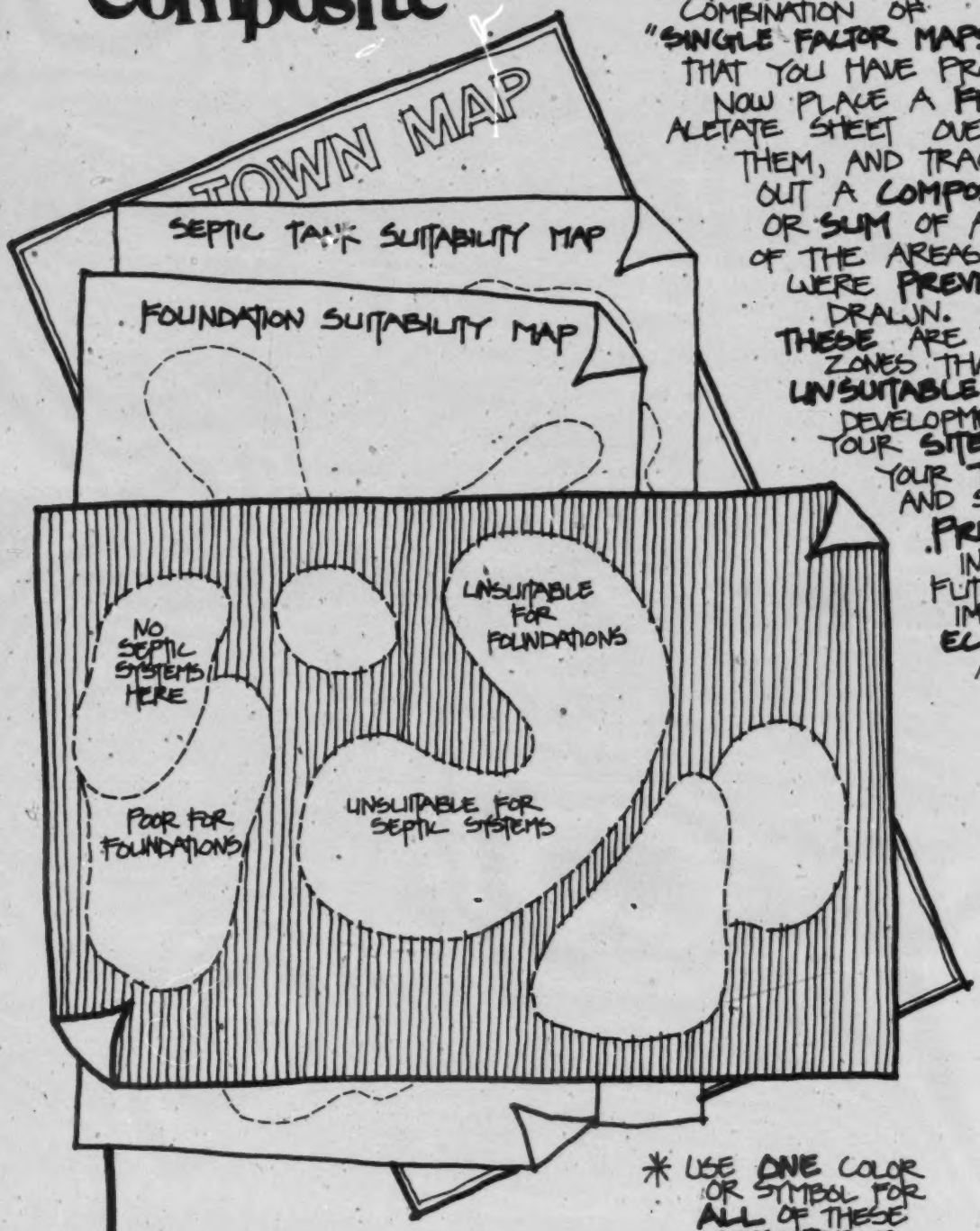
ON A MAP OF YOUR SITE OR TOWN, OVERLAY A SHEET OF TRACING PAPER OR CLEAR ACETATE, AND WITH A PENCIL OR MARKER, MAP OUT THOSE AREAS THAT YOU HAVE DETERMINED TO BE IMPORTANT WILDLIFE HABITATS. BASE YOUR EVALUATIONS ON THE ISSUES DISCUSSED IN THIS SECTION, AND USE ANY SOURCES OF INFORMATION AVAILABLE IN YOUR TOWN. DO FIELD STUDIES TO CHECK YOUR INFORMATION.



* USE THE SAME COLOR OR SYMBOL FOR EACH OF THESE ZONES.

19

mapping out: a Buildability Composite

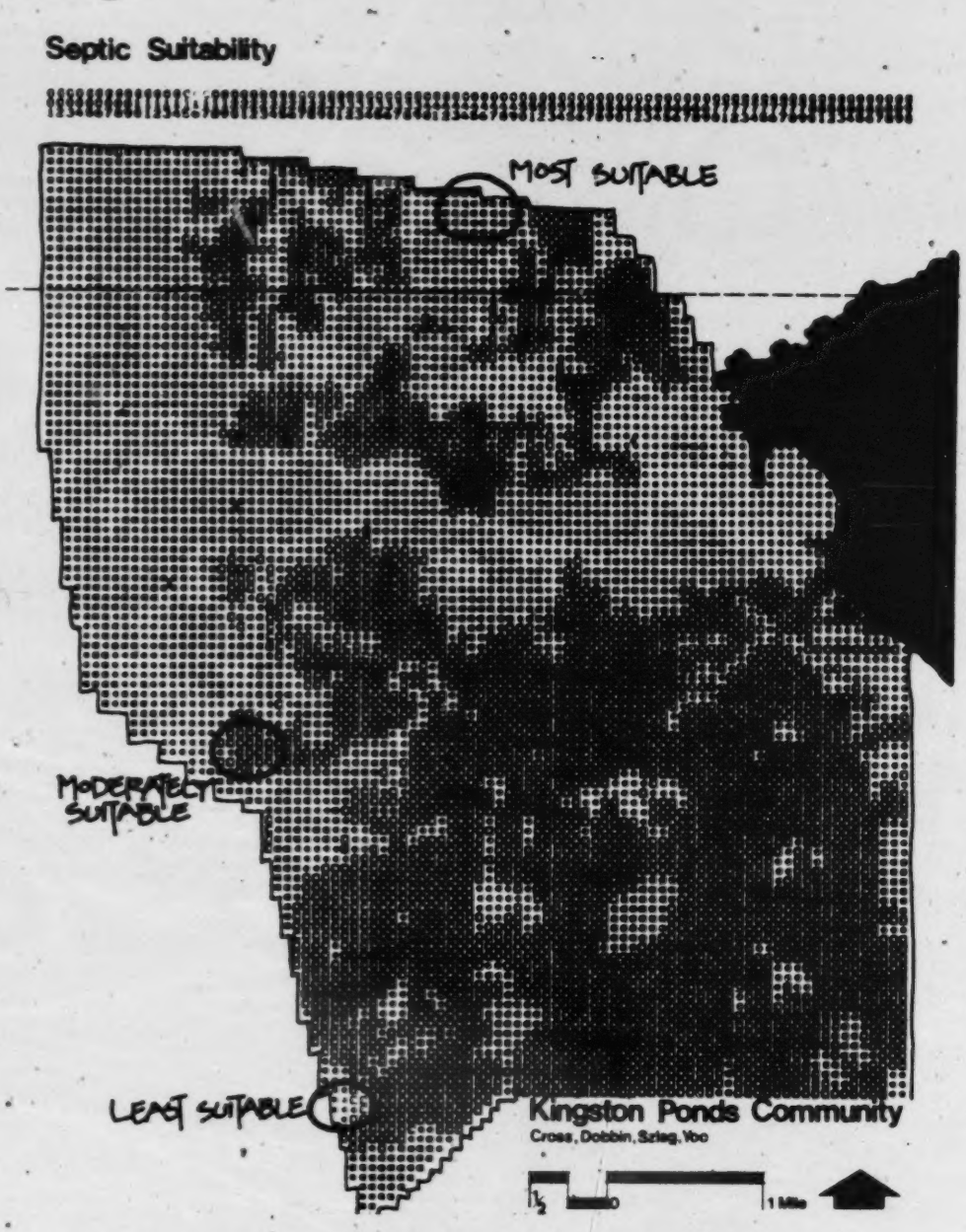


ON A BASE MAP OVERLAY **ALL** OR **ANY** COMBINATION OF **"SINGLE FACTOR MAPS"** THAT YOU HAVE PRODUCED. NOW PLACE A **FINAL** ACETATE SHEET OVER THEM, AND TRACE OUT A **COMPOSITE** OR **SUM** OF ALL OF THE AREAS THAT WERE **PREVIOUSLY** DRAWN. **THESE** ARE THE ZONES THAT ARE **UNSUITABLE** FOR DEVELOPMENT ON YOUR **SITE** OR IN YOUR **TOWN**, AND SHOULD BE **PRESERVED** IN THE FUTURE AS IMPORTANT **ECOLOGICAL** AREAS.

* USE **ONE** COLOR OR SYMBOL FOR **ALL** OF THESE **UNSUITABLE** ZONES.

20

Mapping



SOURCE: DEPARTMENT OF LANDSCAPE ARCHITECTURE
HARVARD GRADUATE SCHOOL OF DESIGN

21

Computer Maps

THIS IS A **COMPUTER** MAP OF THE PERCENT OF **VEGETATIVE COVER** OF AN AREA SOUTH OF BOSTON. THE **DARKER** THE TONE ON THE MAP THE **HIGHER** THE PERCENTAGE OF VEGETATIVE COVER. THE **WHITE** AREAS HAVE **ZERO** COVERAGE AND THE **DARKEST** AREAS ARE COVERED **100%** BY VEGETATION, WITH **EIGHT** INTERMEDIATE LEVELS ALSO RECORDED.

SOURCE: LANDSCAPE ARCHITECTURE RESEARCH OFFICE
HARVARD GRADUATE SCHOOL OF DESIGN 1972-1976
NSF/RANN GRANT # AEN 72-03372-A05

22

GUIDE SHEET # 23

A SYNTHESIS EXERCISE

The major goal of the synthesis unit has been to make you an objective participant in the land use decision making process. All of the activities have centered around the development of a balance between the economic prosperity of a town and its environmental well being.

In this activity, you, as a community decision maker, must propose a building-site for a light industry which would like to open a plant in your community. In addition, you must propose a second site for a potential housing development.

The task will be simplified, due to the fact that there are only seven potential sites available for development. All seven sites are clearly numbered on the topographic map on guide sheet # 24.

Four single factor overlay maps are available for your community. They provide information on slope depths to bedrock depth to water table and flood plain areas. These maps may be used singularly or as composite to give you information on each of the sites. The maps and the accompanying activity deal with extreme situations. As you carry out the activity look for the best sites for construction. There may be several sites that are marginally suitable for development, but we are only interested in the best sites!

THE SLOPE OVERLAY gives us information on where we might find areas with less than 15% slope, slope of 15 - 25% and slope of 25 - 45%. Your map reading skills will help in locating the flatest areas on the topographic map.

KEY TO THE SLOPE OVERLAY

SLOPE - 15 - 25%

SLOPE - 25 - 45%

Place the slope overlay over guide sheet # 24 . . . line up the maps, by putting the triangles in the upper left and lower right corners of the acetate over the similarly located triangles on guide sheet # 24. This procedure will be used to properly align all of the acetate overlays!

THE DEPTH TO BEDROCK OVERLAY provides information on where we might expect to find rock outcrops, where bedrock is less than 10 feet and where bedrock is 10 - 50 feet or more than 50 feet.

KEY TO THE DEPTH TO BEDROCK OVERLAY

BEDROCK OUT CROP

BEDROCK 10 - 50 FEET

BEDROCK LESS THAN 10 FEET

BEDROCK 50 - 300 FEET

How does the information on these overlays influence your site selection?

THE DEPTH TO WATER TABLE OVERLAY DISTINGUISHES BETWEEN AREAS WITH 10 or more feet to water table and areas with less than 10 feet to water table.

KEY TO DEPTH TO WATER TABLE

DEPTH TO WATER LESS THAN 10 FEET

MORE THAN 10 FEET

What problems might one anticipate in areas marked by the horizontal lines (i.e., areas with less than 10 feet to the water table)? How does this new information affect your site selection?

THE FLOOD PLAIN OVERLAY distinguishes between flood prone areas and areas that are not in flood plains .

KEY TO THE FLOOD PLAIN OVERLAY

AREAS PRONE TO FLOOD

DRY AREAS

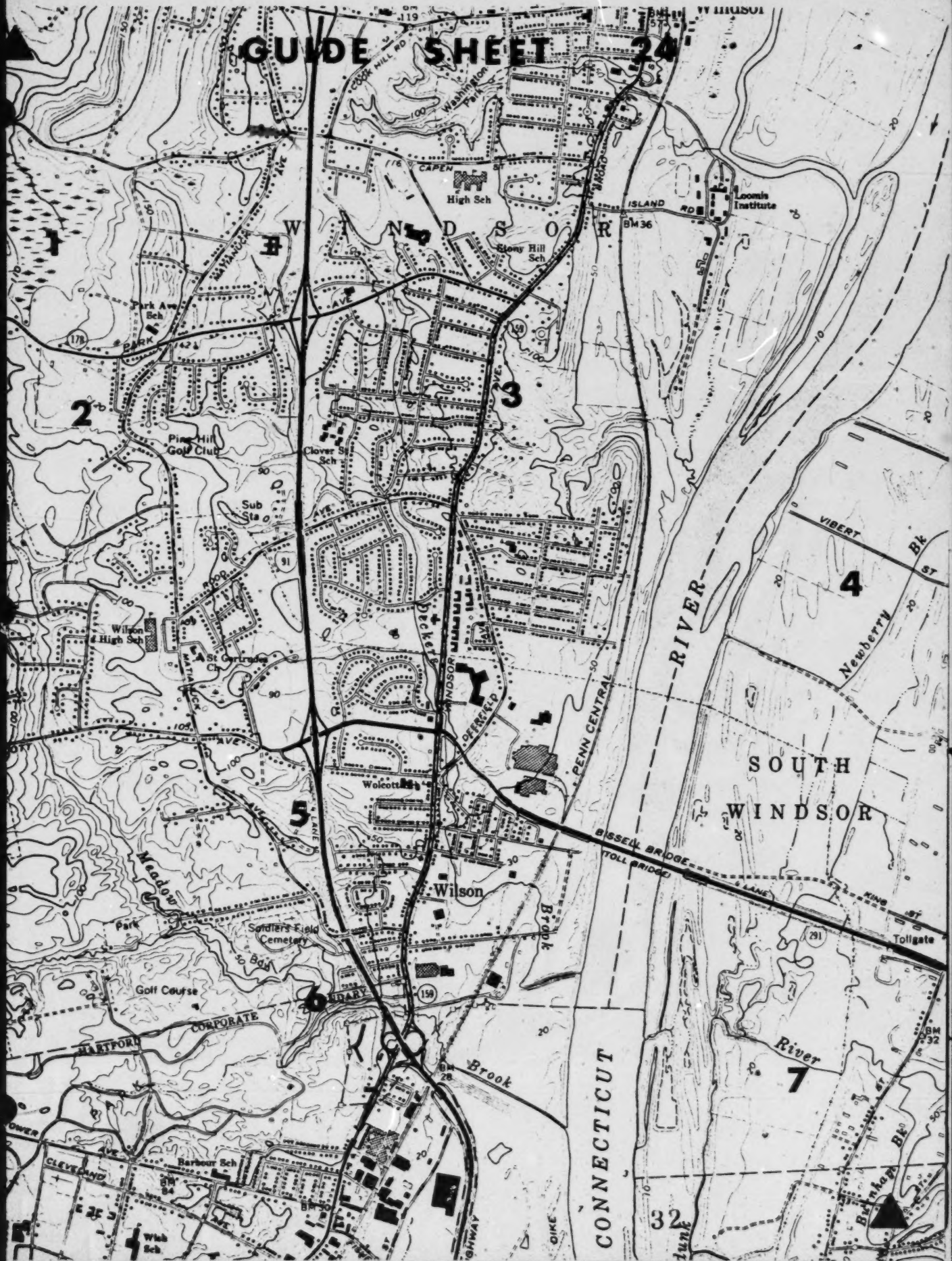
Of what value is this information?

Take time to study each of the single factor maps to identify the site which is most appropriate for a housing development and the site which is most appropriate for light industrial development.

Feel free to go back and review guidesheets that in your estimate have a bearing on the selection of these building sites. An additional activity that may prove to be of value in site selection can be found on guide sheet # 25 and # 26.

When you conclude the site selection activity you may want to compare your decisions with ours. Our choices and a rationale for these choices can be found on guide sheet # 27.

Source of data: Connecticut Valley Urban Area Project, Environmental geologic and Hydrologic Studies, Geologic And Hydrologic Maps for Land-Use Planning, Connecticut Valley Circ, 674.


GUIDE SHEET 24
WINDSOR
SOUTH WINDSOR
RIVER
CONNECTICUT
River
Brook
Wilson
Tollgate
Loomis Institute
High Sch
Stony Hill Sch
Park Ave Sch
Pine Hill Golf Club
Clover St Sch
Sub Sta
Wilson High Sch
St Gertrude Ch
Wolcott
Soldiers Field Cemetery
Golf Course
Meadow Park
Barbour Sch
Newberry Br
Bissell Bridge
Toll Bridge
Penn Central
Washington Park
Island Rd
Broad St
Park Ave
Prospect Ave
Windsor Ave
Main St
Hartford
Corporate
Cleveland Ave
King St
Vibert Br St
1
2
3
4
5
6
7

GUIDE SHEET # 25 DECISION MAKING TABLE FOR SMALL HOUSING DEVELOPMENT

In the following table, a series of questions are asked, which will influence the site selection process for the small housing development. Use the questions to evaluate each of the seven sites. In the blank spaces provided, you may wish to make brief notes as to why particular sites either will or will not meet the criteria for development with regard to the question asked. Put an asterisk in the upper right hand corner of sites which do meet development criteria. After answering all of the questions for all of the sites, the site receiving the largest number of asterisks will be the best site on which to locate the small housing development.

Small Housing Development: Questions	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	
1. Can a basement or foundation be properly and economically located on the site?								
2. Will topography, depth to water-table, depth to bedrock case problems in the design and installation of an on-site septic system?								
3. Will the area be subjected to critical erosion problems?								
4. Will the area be subjected to flooding?								
5. Will development of the site create unacceptable traffic flow or noise patterns?								
6. Is this proposed site development compatible with existing and projected land uses in the area?								
7. Will development in this area cause ground water contamination?								
8. Is the proposed site in close proximity to transportation arteries and community services?								

The best location for the small housing development is site # _____

Additional Notes:

GUIDE SHEET # 26

DECISION MAKING TABLE FOR INDUSTRIAL DEVELOPMENT

In the following table, a series of questions are asked, which will influence the site selection process for the industrial development. Use the questions to evaluate each of the seven sites. In the blank spaces provided, you may wish to make brief notes as to why particular sites either will or will not meet the criteria for development with regard to the question asked. Put an asterisk in the upper right hand corner of sites which do meet development criteria. After answering all of the questions for all of the sites, the site receiving the largest number of asterisks will be the best site on which to locate the small housing development.

Industrial Development: Questions	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	
1. Can a foundation be properly and economically located on the site?								
2. Will topography, depth to water-table, depth to bedrock cause problems in the design and installation of an on-site septic system?								
3. Will the area be subjected to critical erosion problems?								
4. Will the area be subjected to flooding?								
5. Will development of the site create unacceptable traffic flow or noise patterns?								
6. Is this proposed site development compatible with existing and projected land uses in the area?								
7. Will development in this area cause ground water contamination?								
8. Is the proposed site in close proximity to railroads and major highways?								

The best location for the industrial development is site #_____.

GUIDE SHEET # 27

DEVELOPMENT CONSIDERATIONS

By now you have probably established the fact that sites #2 and #3 are the most promising sites for development.

Site #2 would be a prime location for a residential development. The site is close to a secondary road, and expands an area that is already residential in character. Churches, schools and recreation facilities are all in close proximity to the site. In addition, the site meets the standard physical criteria for development.

Site #2 provides ideal conditions for building foundations and dry basements. In designing on-site septic systems one would not encounter problems with high water table, rock outcrops, shallow bedrock or slope. The site is not in a floodplain and thus would not be subject to seasonal flooding. Erosion would not be a problem on the site during or following construction provided that minimal erosion control techniques are employed.

In our estimate, site #3 is most appropriate for the industrial complex. because it is close to a major highway and the railroad tracks. Traffic flow to and from the site will not go through residential areas. In addition, the site meets all the requirements of a developable site. A foundation for the light industrial plant can be built properly and economically on site #3. If on site sewers are required, one would not encounter problems with a high water table, rock outcrops, shallow bedrock or slope. The site is not in a flood plain and thus would not be subject to seasonal flooding. Normal construction procedures would not cause major erosion problems on the site. Because of the site's proximity to major transportation arteries and its isolation from residential areas, the industrial development would not be expected to generate noise or traffic problems.

RATIONALE FOR REJECTING THE ALTERNATIVE SITES.

Site #1 was rejected since it is in a wetland. Information from this unit and the unit on inland wetlands provides large quantities of data to support the argument that building in wetlands is economically and environmentally expensive.

Sites #4 and #7 were ruled out because they are located in the flood plain of the Connecticut River. Because of their locations, these areas would be subject to seasonal flooding. In addition, since the water table is close to the surface, problems may be encountered in building a solid foundation. The location would require special construction considerations. Finally, the combination of the high water table and seasonal flooding would prevent the installation of on-site septic systems.

Site #5 was not selected because of the slope of the site and the fact that the water table is within ten feet of the ground surface. These factors would require the developer to use special construction techniques. Soil erosion on the site could be a major problem. Slope and water table may cause major problems in designing and installing an on-site septic system.

Site #6 has two major problems. Bedrock is less than 10 feet below the surface on this site. As a result, the developer may have difficulties excavating the area for a basement or subsurface storage area. The shallow bedrock coupled with the high water table may cause problems in designing and installing an on-site septic system.

GUIDE SHEET # 28

NATURAL RESOURCE CONSIDERATIONS FOR THE EVALUATION OF:

SUBDIVISIONS, PLAN UNIT DEVELOPMENTS, ETC.

I. Expansion of Sewer and/or Water Services

A. Feasibility of Expanding Existing Systems

1. What is the proximity of proposed subdivision to existing system?
2. Can existing system adequately handle projected additional load?

B. Expansion and Construction of Collection or Transmission Lines

1. Will excavation of materials involve only overburden or both overburden and bedrock?
2. If bedrock must be excavated, what will be magnitude of costs?
3. Will type of overburden affect operation of equipment or economic considerations?
4. Will trench need dewatering (pumping) during construction?
5. Does a drainage, water body or other wetland have to be crossed or traversed?
6. How will changes in relief affect pipe size and need for pumping stations?

II. On-Site Water Supply

A. Water Quantity of Wells in Overburden

1. Does calculated potential supply meet projected demand?
2. Can water be withdrawn at a sufficient rate?
3. What is the long-term safe yield of the aquifer?

B. Water Quantity of Wells in Bedrock

1. Will rock allow passage or circulation of water through it?
2. Is rock sufficiently fractured to allow water flow?

C. Water Quality

1. Will rock or overburden contribute dissolved minerals to ground water?
2. What is the proximity of present sources of pollution, i.e.; septic and other discharges, landfills?
3. Are future developments planned that may influence water quality?

III. On-Site Septic System

A. Installation of System in Ground

1. Is there a sufficient thickness of overburden in which to place tank and leachfield?

B. Operation of Leachfield

1. Is there sufficient thickness of overburden to contain effluent below land surface?
2. Are the soils and underlying unconsolidated materials capable of containing and transmitting effluent below land surface?
3. Are the soils and underlying unconsolidated materials capable of renovating effluent?
4. Will topography influence movement of effluent adversely causing it to breakthrough to land surface?
5. Is there a seasonal or permanent high water table or condition of soil saturation that may cause back-up and/or breakthrough of effluent?
6. Will leachfield be subjected to periodic or intermittent flooding?

C. Contamination of Water Resources

1. Will the possibility of contamination of a water supply watershed be increased?
2. Will the possibility of contamination of other surface water bodies occur?
3. Will water quality of a potentially favorable ground water site or aquifer be affected?
4. Will water quality of other ground water bodies potentially suffer?

SOURCE: Natural Resource Center, Connecticut Department of Environmental Protection

IV. Site Development

A. Construction of Building or Structure

1. Will excavation of materials for foundation involve only overburden or both overburden and bedrock?
2. Will type of overburden affect operation of equipment or economic considerations?
3. Will slope or relief be probibitive to operation of conventional construction equipment?
4. Will excavation for foundation or footings need dewatering (pumping) during construction?

B. Stability and Efficiency of Building or Structure

1. Will basement be seasonally or permanently wet?
2. Will the site be subjected to intermittent
3. Will the structure be endangered by movement of supporting earth materials?
4. Will the surrounding area be subjected to critical erosion problems?

C. Potential Expenditure of Public Funds for Corrective Action

1. Will the area be subjected to flooding, either tidal or inland?
2. Will public land or watercourses be detrimentally affected by erosion and/or sedimentation.

V. Road Network

A. Adequacy of Existing Road System

1. What is proximity of proposed subdivision to existing system?
2. Can existing system adequately handle projected additional load?

B. Expansion and Construction of Roads

1. Will any excavations of material involve only overburden or both overburden and bedrock?
2. If Bedrock must be excavated what will be magnitude of costs?
3. Will type of overburden affect operation of equipment or economic considerations?
4. Will problems in construction and/or maintenance of road system result because of high water table or saturated soils?
5. Does a drainage, water body or other wetland have to be crossed or traversed?
6. Will road be subjected to periodic or intermittent flooding?
7. Will culverts be adequately designed to conform with regulations?
8. Will grade design and road location conform to regulations?

VI. Hazards and Nuisances, Natural and Man Induced

A. Water Related Hazards and Nuisances

1. Is the area prone to inland or tidal flooding?
2. Will local watercourses be dangerous because of currents, dropoffs, etc.?

B. Atmospheric Related Hazards and Nuisances

1. Is the area prone to: severe winds? extreme temperatures? heavy fogs? snow drifting?
2. Will proposed land use alter climatic conditions to make site and/or adjacent area less desirable?
3. Will proposed land use comply with air quality standards?
4. Will the surrounding existing or future land use create noise and/or odor nuisance?

C. Earth Related Hazards and Nuisances

1. Is the area prone to: rockfalls? landslides? earthquakes?
2. Are there cliffs and/or steep slopes present that are potentially dangerous?

D. Biologically Related Hazards and Nuisances

VII. Resource Protection

A. Protection, Preservation or Conservation of Valuable Resources

1. Will the proposed land use have an adverse affect on the following resources:

NATURAL - significant ecologic habitats?
- resource management areas?
- other unique and fragile features?

CULTURAL - historic sites?
- views and vistas?
- recreation areas?
- educational and scientific areas?

ECONOMIC - water supply watersheds?
- favorable groundwater areas?
- mineral resource areas?

VIII. Services to Support Development

A. Presence or Development of Facilities to Support Development

1. Do proper services exist or can they be reasonably expanded or developed in the following areas:

- employment
- education
- safety
- recreation
- commercial
- transportation

IX. Compatibility of Surrounding Land Uses

A. Present and Future Efficienty of Development

1. Is the proposed site development compatible with existing and future land uses?

B. Determination of Best Land Use

1. Is the land being put to the best use relative to existing or potential resources?

GUIDE SHEET # 29

Preliminary Draft - 9/1/73 - Subject to Change

NATURAL RESOURCE CONSIDERATIONS FOR THE EVALUATION OF: SUBDIVISIONS, PLAN UNIT DEVELOPMENTS, ETC.

ITEM FOR CONSIDERATION: Expansion of Sewer and/or Water Services			CRITERIA FOR EVALUATION (Based on State, Regional, or Site Inventories)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	USUALLY NEEDS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Feasibility of Expanding Existing Systems	What is the proximity of proposed subdivision to existing system?	Location of Existing Sanitary and Water Related Facilities and Uses Local Plans and/or Information (3) Information Composite	Within existing service area	Near existing service area Within planned service area	Distant from existing service area Outside planned service area
	Can existing system adequately handle projected additional load?	Local Plans and/or Information (3)	Total load falls within design capacity of system	Near design capacity, expansion of system proposed	System already at full capacity and expansion not proposed
Expansion and Construction of Collection or Transmission Lines	Will excavation of materials involve only overburden or both overburden and bedrock?	Depth to Bedrock Map Rocky and Shallow to Bedrock Soils (3) Surficial Geologic Map Bedrock Geologic Map On-Site Inspection Information Composite	Greater than 10 feet Bedrock/Less than 2 feet Boring show excessive depth	Less than 10 feet Bedrock/Greater than 2 feet Thin drift Boring show marginal conditions	Outcrop Bedrock Outcrop Outcrop observed
	If bedrock must be excavated, what conditions will affect costs?	Bedrock Geologic Map On-Site Inspection Information Composite	Soft, fractured rock (Engineering tests)	Hard, unfractured rock	
	Will type of overburden affect operation of equipment or economic considerations?	Unconsolidated Materials Map Natural Soil Groups Map (3) Surficial Geologic Map On-Site Inspection Information Composite	Sand, gravel and fine grained deposits A, B, E, F, G Stratified drift units Loose deposits	Till C, D Till Compact deposits	Talus Talus Boulder concentrations
	Will trench need dewatering (pumping) during construction or surface water transversed?	Depth to Water Table Map Soils Saturated Within 3' of Surface 1-2 Months (3) Soils Saturated Within 3' of Surface 2-12 Months (3) Inland Wetlands and Water Courses On-Site Inspection Information Composite	Greater than 10 feet Not within unit or within unit but dry conditions at time of construction Not within wetland or water system Pits, borings show no dewatering necessary at time of construction	Less than 10 feet Within unit encountered at time of construction Within wetland Pits, borings show marginal water table conditions	Surface water Within water course Surface water observed
	How will changes in relief affect pipe size and need for pumping stations?	Topography Map Orthophoto Quad Natural Land Slopes Map On-Site Inspection Information Composite			

SOURCE: Natural Resource Center, Connecticut Department of Environmental Protection

GUIDE SHEET # 29 (CONTINUED)

ITEM FOR CONSIDERATION: On-Site Water Supply			CRITERIA FOR EVALUATION (Based on Water, Resource, or Site Information)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	USUALLY MEANS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Water Quantity	Can a high yielding well be developed in unconsolidated material?	Geohydrologic Map (4)	Within favorable ground-water area		Not within favorable ground-water area
		Availability of Ground Water Map	Within area where expected well yields are 50-3000 gpm	Within area where expected well yields are 20-500 gpm	Within area where expected well yields are less than 25 gpm
		On-Site Inspection	Test well shows sufficient yield	Test well shows marginal yield	Test well shows insufficient yield
		Information Currently			
	Will bedrock yield sufficient water for individual wells?	Availability of Ground Water Map	Within area where expected well yields are from less than 10 gpm to 900 gpm	Within area where wells have a 90% chance of obtaining at least 5 gpm	
		Bedrock Geologic Map	Area is underlain by crystalline bedrock	Area underlain by crystalline bedrock	
		Local Plans and/or Information (3)	Existing wells in area show adequate yields	Existing wells in area show marginal yields	Existing wells in area show poor yields
		On-Site Inspection	Bedrock is highly fractured and/or permeable		Bedrock is unfractured and impermeable
		Information Currently			
Water Quality	Will rock or overburden contribute dissolved minerals to ground water?	Bedrock Geologic Map		Rock type in area prone to contribution of mineral to water	
		Geohydrologic Map (4)	Development is not within area having potential problems	Development is within area identified as having potential problems with hardness, iron or chlorides	
		On-Site Inspection	Tests indicate good water quality	Tests indicate nuisance mineral content	Tests indicate toxic mineral content
		Information Currently			
	What is the proximity of present sources of pollution, i.e., septic and other discharges, landfills?	Geological Map			
		Location of Existing Sanitary and Water Related Facilities	No pollution source in area	Potential pollution source nearby has been identified	
		Local Plans and/or Information (3)			
		Information Currently			
	Are future developments planned that may influence water quality?	Municipal Zoning			

GUIDE SHEET # 29 (CONTINUED)

ITEM FOR CONSIDERATION: On-Site Septic System			CRITERIA FOR EVALUATION (Based on Maps, Reports, or Site Inspection)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	USUALLY NEEDS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Installation of System in Ground	Is there a sufficient thickness of overburden in which to place tank and leachfield?	Depth to Bedrock Map	Greater than 10 feet	Less than 10 feet	Outcrop
		Rocky and Shallow to Bedrock Soils (1)		Greater than 2 feet	Rockland
		Surficial Geologic Map		Thin drift	Outcrop
		Bedrock Geologic Map			Outcrop
		On-Site Inspection	Pits show sufficient depth	Pits show marginal depth	Outcrop observed
		Information Composite			
Operation of Leachfield	Is there sufficient thickness of overburden to contain effluent below land surface?	Depth to Bedrock Map	Greater than 10 feet	Less than 10 feet	Outcrop
		Rocky and Shallow to Bedrock Soils (1)		Greater than 2 feet	Rockland
		Surficial Geologic Map		Thin drift	Outcrop
		Bedrock Geologic Map			Outcrop
		On-Site Inspection	Pits show sufficient depth	Pits show marginal depth	Outcrop observed
		Information Composite			
	Are the soils and underlying unconsolidated materials capable of containing and transmitting effluent below land surface?	Unconsolidated Materials Map	Sand, gravel	Till, fines	Till, fines
		Natural Soils Groups Map (2)	Well drained soils	Moderately well drained soils	Poorly to very poorly drained soils
		Surficial Geologic Map	Stratified drift units	Stratified drift units, till	Till
		Percolation Rate Classes of Soils (1)	Fast to probably fast	Probably slow	Slow
		On-Site Inspection	Favorable percolation test	Marginal percolation test	Poor percolation test
		Information Composite			
	Are the soils and underlying unconsolidated materials capable of renovating effluent?	Unconsolidated Materials Map			
		Natural Soils Groups Map (2)			
		On-Site Inspection			
		Information Composite			
	Will topography influence movement of effluent adversely causing it to breakthrough to land surface?	Topographic Map	Level Terrain	Moderate changes in topography	Severe, abrupt changes in topography
		Orthophoto			
		Natural Land Slopes Map			
		On-Site Inspection			
		Information Composite			
	Is there a seasonal or permanent high water table or condition of soil saturation that may cause back-up and/or breakthrough of effluent?	Depth to Water Table Map	Greater than 10 feet	Less than 10 feet	Surface water
		Soils Saturated Within 3' of Surface 1-2 Months (1)	Not within area potentially saturated	Within area potentially saturated	
		Soils Saturated Within 3' of Surface 2-12 Months (1)	Not within area potentially saturated		Within area potentially saturated
		Inland Wetlands and Water Courses	Not within wetland area of water source		Within wetland or water source
		On-Site Inspection	Pits show favorable water table conditions	Pits show marginal water table conditions	Surface water observed
		Information Composite			
	Will leachfield be subjected to periodic or intermittent flooding?	Floodprone Areas Map	Not within floodprone area	Within floodprone area, but rarely flooded	Within area commonly flooded
		Channel Encroachment Lines and Floodplain Delineation	Not within channel encroachment or floodplain	Within floodplain but not encroachment area	Within channel encroachment area
		Historic Data	No historic record of flooding	Area only flooded rarely	Area commonly flooded
		On-Site Inspection	No surface water in area		
		Information Composite			
Contamination of Water Resources	Will the possibility of contamination of a water supply watershed be increased?	Location of Existing Sanitary and Water Related Facilities Services and Data	Not within water supply watershed	Low density development within watershed	Large, high density development within watershed
		Water Use Policy Map (2)			
		Conservation Areas Map (2)			
		Information Composite			
	Will water quality of a potentially favorable ground water site or aquifer be affected?	Availability of Ground Water Map	Not near favorable ground water area	Low density development over favorable ground water area	High density development over favorable ground water area
		Geohydrologic Map (4)			
		Water Use Policy Map (2)			
		Conservation Areas Map (2)			
		Information Composite			

Source:
Natural Resources Center
DEP
8-74

GUIDE SHEET # 29 (CONTINUED)

ITEM FOR CONSIDERATION: On-Site Septic System			CRITERIA FOR EVALUATION (Based on Maps, Reports, or Site Inspection)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	USUALLY NEEDS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Installation of System in Ground	Is there a sufficient thickness of overburden in which to place tank and leachfield?	Depth to Bedrock Map	Greater than 10 feet	Less than 10 feet	Outcrop
		Rocky and Shallow to Bedrock Soils (1)		Greater than 2 feet	Rockland
		Surficial Geologic Map		Thin drift	Outcrop
		Bedrock Geologic Map			Outcrop
		On-Site Inspection	Pits show sufficient depth	Pits show marginal depth	Outcrop observed
		Information Composite			
Operation of Leachfield	Is there sufficient thickness of overburden to contain effluent below land surface?	Depth to Bedrock Map	Greater than 10 feet	Less than 10 feet	Outcrop
		Rocky and Shallow to Bedrock Soils (1)		Greater than 2 feet	Rockland
		Surficial Geologic Map		Thin drift	Outcrop
		Bedrock Geologic Map			Outcrop
		On-Site Inspection	Pits show sufficient depth	Pits show marginal depth	Outcrop observed
		Information Composite			
	Are the soils and underlying unconsolidated materials capable of containing and transmitting effluent below land surface?	Unconsolidated Materials Map	Sand, gravel	Till, fines	Till, fines
		Natural Soils Groups Map (5)	Well drained soils	Moderately well drained soils	Poorly to very poorly drained soils
		Surficial Geologic Map	Stratified drift units	Stratified drift units, till	Till
		Percolation Rate Classes of Soils (1)	Fast to probably fast	Probably slow	Slow
		On-Site Inspection	Favorable percolation test	Marginal percolation test	Poor percolation test
		Information Composite			
	Are the soils and underlying unconsolidated materials capable of renovating effluent?	Unconsolidated Materials Map			
		Natural Soils Groups Map (5)			
		On-Site Inspection			
		Information Composite			
	Will topography influence movement of effluent adversely causing it to breakthrough to land surface?	Topographic Map	Level Terrain	Moderate changes in topography	Severe, abrupt changes in topography
		Orthophoto			
		Natural Land Slopes Map			
		On-Site Inspection			
		Information Composite			
	Is there a seasonal or permanent high water table or condition of soil saturation that may cause back-up and/or breakthrough of effluent?	Depth to Water Table Map	Greater than 10 feet	Less than 10 feet	Surface water
		Soils Saturated Within 3' of Surface 1-2 Months (1)	Not within area potentially saturated	Within area potentially saturated	
		Soils Saturated Within 3' of Surface 2-12 Months (1)	Not within area potentially saturated		Within area potentially saturated
		Inland Wetlands and Water Courses	Not within wetland area of water course		Within wetland of water course
		On-Site Inspection	Pits show favorable water table conditions	Pits show marginal water table conditions	Surface water observed
		Information Composite			
	Will leachfield be subjected to periodic or intermittent flooding?	Floodprone Areas Map	Not within floodprone area	Within floodprone area, but rarely flooded	Within area commonly flooded
		Channel Encroachment Lines and Floodplain Delineation	Not within channel encroachment or floodplain	Within floodplain but not encroachment area	Within channel encroachment area
		Historic Data	No historic record of flooding	Area only flooded rarely	Area commonly flooded
		On-Site Inspection	No surface water in area		
		Information Composite			
Contamination of Water Resources	Will the possibility of contamination of a water supply watershed be increased?	Location of Existing Sanitary and Water Related Facilities Services and Uses	Not within water supply watershed	Low density development within watershed	Large, high density development within watershed
		Water Use Policy Map (2)			
		Conservation Areas Map (2)			
		Information Composite			
	Will water quality of a potentially favorable ground water site or aquifer be affected?	Availability of Ground Water Map	Not near favorable ground water area	Low density development over favorable ground water area	High density development over favorable ground water area
		Geohydrologic Map (6)			
		Water Use Policy Map (2)			
		Conservation Areas Map (2)			
		Information Composite			

Source:
Natural Resources Center
DEP
M-74

GUIDE SHEET # 29 (CONTINUED)

ITEM FOR CONSIDERATION: (4) Site Development			CRITERIA FOR EVALUATION (Based on Maps, Reports, or Site Inspection)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	USUALLY NEEDS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Construction of Building or Structure	Will excavation of materials for foundation involve only overburden or both overburden and bedrock?	Depth to Bedrock Map	Greater than 10 feet	Less than 10 feet	Outcrop
		Rocky and Shallow to Bedrock Soils (1)		Greater than 2 feet	Rockland
		Surficial Geologic Map		Thin drift	Outcrop
		Bedrock Geologic Map			Outcrop
		On-Site Inspection	Borings, pits show sufficient depth	Borings, pits show marginal depth	Outcrop observed
		Information Composite			
	Will type of overburden affect operation of equipment or economic considerations?	Unconsolidated Materials Map	Gravel, sand, fine stratified deposits	Till	Talus
		Natural Soil Groups Map (1)	A, B, E, F, G	C, D	D
		Surficial Geologic Map	Stratified drift deposits	Till	Talus
		On-Site Inspection	Loose deposits	Compact deposits	Boulder concentrations
		Information Composite			
	Will slope or relief be prohibitive to operation of conventional construction equipment?	Topographic Map			
		Orthophoto			
		Natural Land Slopes Map			
		General Slope Map (1)			
		On-Site Inspection			
		Information Composite			
	Will excavation for foundation or footings need dewatering (pumping) during construction?	Depth to Water Table Map	Greater than 10 feet	Less than 10 feet	Surface water
		Soils Saturated Within 3' of Surface 1-2 Months (1)	Not within unit or within unit but dry conditions at time of construction	Within unit saturated at time of construction	
		Soils Saturated Within 3' of Surface 2-12 Months (1)			
		Inland Wetlands and Water Courses	Not within wetland or water course	Within wetland	Within water course
		On-Site Inspection	Pits, borings show favorable water table conditions	Pits, borings show marginal water table conditions	Surface water observed
		Information Composite			
Stability and Efficiency of Building or Structure	Will basement be seasonally or permanently wet?	Depth to Water Table Map	Greater than 10 feet	Less than 10 feet	Surface water
		Soils Saturated Within 3' of Surface 1-2 Months (1)	Not within area potentially saturated	Within area potentially saturated	
		Soils Saturated Within 3' of Surface 2-12 Months (1)	Not within area potentially saturated		Within area potentially saturated
		Inland Wetlands and Water Courses	Not within wetland area or water course		Within wetland or water course
		On-Site Inspection	Pits, borings show favorable water table conditions	Pits, borings show marginal water table conditions	Surface water observed
		Information Composite			
	Will the site be subjected to intermittent flooding?	Floodprone Areas Map	Not within floodprone area	Within floodprone area but only rarely flooded	Within area commonly flooded
		Channel Encroachment Lines and Floodplain Delineation	Not within channel encroachment or floodplain	Within floodplain but not encroachment area	Within channel encroachment area
		Historic Data	No historic record of flooding	Area only flooded rarely	Area commonly flooded
		On-Site Inspection			
		Information Composite			
	Will the structure be endangered by movement of supporting earth materials?	Erosion and Sediment Control Handbook (5)			
		On-Site Inspection			
		Information Composite			
Potential Expenditure of Public Funds for Corrective Action	Will the area be subjected to flooding, either tidal or inland?	Floodprone Areas Map	Not within floodprone area		Within floodprone area
		Channel Encroachment Lines and Floodplain Delineation	Not within channel encroachment or floodplain area		Within channel encroachment lines
	Will public land or water courses be detrimentally affected by erosion and/or sedimentation	Erosion and Sediment Control Handbook (5)			
		On-Site Inspection			
		Information Composite			

GUIDE SHEET # 29 (CONTINUED)

ITEM FOR CONSIDERATION: (g) Road Network

CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	CRITERIA FOR EVALUATION (Based on Maps, Reports, or Site Inspection)		
			USUALLY NEEDS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Adequacy of Existing Road System	What is proximity of proposed subdivision to existing system?	Town Road Map Topographic Map Orthophoto Local Plans and/or Information (3) Information Composite	Roads exist in area	Roads close to area Roads planned for area	Roads do not exist Roads not planned
	Can existing system adequately handle projected additional load?	Local Plans and/or Information (3)	Presently existing roads can handle traffic increase without modification	Existing roads can handle traffic increase with only small modifications	Major rebuild or existing roads necessary
Expansion and Construction of Roads	Will excavations of material involve only overburden or both overburden and bedrock?	Depth to Bedrock Map Rocky and Shallow to Bedrock Soils (1) Surficial Geologic Map Bedrock Geologic Map On-Site Inspection Information Composite	Greater than 10 feet Borings, pits show sufficient depth	Less than 10 feet Greater than 2 feet Thin drift Outcrop Borings, pits show marginal conditions	Outcrop Rockland Outcrop Outcrop observed
	If bedrock must be excavated what conditions will affect cost?	Bedrock Geologic Map On-Site Inspection Information Composite	Soft, intermediate rock (Engineering tests)	Hard, consolidated rock	
	Will type of overburden affect operation of equipment or economic considerations	Unconsolidated Materials Map Natural Soil Groups Map (1) Surficial Geologic Map On-Site Inspection Information Composite	Sand, gravel and fine grained deposits A, B, E, G Stratified drift, valley Borings, test show material workable and stable	Till and fine grained deposits C, D, E, F, G Till Borings, tests show material unstable	Talus Talus
	Will problems in construction and/or maintenance of road system result because of high water table or saturated soils?	Depth to Water Table Map Soils Saturated Within 3' of Surface 1-2 Months (1) Soils Saturated Within 3' of Surface 2-12 Months (1) Inland Wetlands and Water Courses On-Site Inspection Information Composite	Greater than 10 feet Not within area potentially saturated Not within area potentially saturated Not within wetland area or water courses Borings show favorable water table conditions	Less than 10 feet Within area potentially saturated Borings show marginal water table conditions	Surface water Within area potentially saturated Within wetland or water courses Surface water observed
	Does a drainage, water body or other wetland have to be crossed or traversed?	Topographic Map Orthophoto Inland Wetlands and Water Courses Drainage Areas Map On-Site Inspection Information Composite	No water body or wetland in area	Minor water body or wetland in road path	Major water body or wetland must be crossed
	Will road be subjected to periodic or intermittent flooding?	Floodprone Areas Map Channel Encroachment Lines and Floodplain Delineation Historic Data On-Site Inspection Information Composite	Not within floodprone area Not within channel encroachment or floodplain No historic record of flooding No surface water in area	Within floodprone area but rarely flooded Within floodplain but not encroachment area Area only flooded rarely	Within area commonly flooded Within channel encroachment area Area commonly flooded
	Will culverts be adequately designed to conform with regulations?	Drainage Areas Map Unconsolidated Materials Map Natural Land Slopes Map General Slope Map (1) Soc. of Land: 1970 On-Site Inspection Information Composite Regulations			
	Will grade design and road location conform to regulations?	Natural Land Slopes Map General Slope Map (1) Topographic Map Orthophoto On-Site Inspection Composite Inventory Regulations			

GUIDE SHEET # 29 (CONTINUED)

ITEM FOR CONSIDERATION: (a) Hazards and Nuisances, Natural and Man Induced			CRITERIA FOR EVALUATION (Based on Maps, Records, or Site Inspection)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	USUALLY NEEDS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Water Related Hazards and Nuisances	Is the area prone to periodic or intermittent flooding?	Floodprone Areas Map Channel Encroachment Lines and Floodplain Delineation Historic Data On-Site Inspection Information Composite	Not within floodprone area Not within channel encroachment or floodplain No historic record of flooding	Within floodprone area but very rarely flooded Within floodplain but not encroachment area Area only flooded rarely	Within area commonly flooded Within channel encroachment area Area commonly flooded
	Will local water courses be dangerous because of currents, dropoffs, etc.?	Topographic Map Orthophoto Drainage Area Map On-Site Inspection Information Composite	No dangerous conditions	Extremely dangerous conditions	
Atmospheric Related Hazards and Nuisances	Is the area prone to: severe winds? extreme temperatures? heavy fogs? snow drifting?	Climate of Connecticut Topographic Map Orthophoto Use of Land: 1970 Local Plans and/or Information (3) On-Site Inspection Information Composite	Incidence of fog or snow are slight. Severe winds and temperatures do not occur	Severe winds and temperatures occur but are infrequent. Occurrence of fog and snow are common	
	Will proposed land use alter climatic conditions to make site and/or adjacent area less desirable?	Topographic Map Orthophoto Use of Land: 1970 Climate of Connecticut Local Plans and/or Information (3) On-Site Inspection Information Composite	Level or gentle terrain slight removal of obstructions and vegetation screens	Steep terrain; change of topography necessary; removal of large amounts of vegetation necessary	
	Will proposed land use comply with air quality standards?				
	Will the surrounding existing or future land use create noise and/or odor nuisance?	Use of Land: 1970 Local Plans and/or Information (3) Climate of Connecticut On-Site Inspection Information Composite			
Earth Related Hazards and Nuisances	Is the area prone to: earthquakes? rockfalls? landslides?	Seismic Data Interpretation On-Site Inspection	No dangerous conditions		Extremely dangerous conditions
	Are there cliffs and/or steep slopes present that are potentially dangerous?	Topographic Map Orthophoto Natural Land Slopes Map On-Site Inspection Information Composite	No dangerous conditions	Extremely dangerous conditions	
Biologically Related Hazards and Nuisances					

GUIDE SHEET # 29 (CONTINUED)

ITEM FOR CONSIDERATION: (7) Resource Protection			CRITERIA FOR EVALUATION (Based on Maps, Research, or Site Inspection)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	NORMALLY NEEDS GOAT NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Protection, Preservation or Conservation of Valuable Resources	Will the proposed land use have an adverse affect on the following resources:	Local Plans and/or Information On-Site Inspection Information Copyright			
	Natural -				
	- Significant ecologic habitats?	Major Open Spaces Inland Wetlands and Water Courses Natural Areas (6) On-Site Inspection			
	- Resource management areas?	Major Open Spaces			
	- Other unique and fragile features?	Local Plans			
	Cultural -				
	- Historic sites?	Local Plans and/or Information			
	- Views and vistas?	Topographic Map Orthophoto Local Plans and/or Information			
	- Recreation areas?	Local Plans and/or Information			
	- Educational and scientific areas?	Local Plans and/or Information Inland Wetlands and Water Courses			
	Economic -				
	- Water supply watershed?	Plan of Conservation and Development Use of Land: 1970			
	- Favorable ground water areas?	USGS Basin reports Plan of Conservation and Development			
	- ? - Favorable agricultural areas?	Soil Survey			
	- Mineral resource areas?	Potential Aggregate Coarse Aggregate CVUAP, USGS			

GUIDE SHEET # 29 (CONTINUED)

ITEM FOR CONSIDERATION: (B) Services to Support Development			CRITERIA FOR EVALUATION (Based on Maps, Records, or Site Inspection)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	USUALLY NEEDS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Presence or Development of Facilities to Support Development	Do proper services exist or can they be reasonably expanded or developed in the following areas:				
	- Employment				
	- Education				
	- Safety				
	- Recreation				
	- Commercial				
	- Transportation				

ITEM FOR CONSIDERATION: (A) Compatibility of Surrounding Land Uses			CRITERIA FOR EVALUATION (Based on Maps, Records, or Site Inspection)		
CONCERN	CONDITION TO EVALUATE	RESOURCE INFORMATION NEEDED FOR EVALUATION	USUALLY NEEDS ONLY NORMAL CONSIDERATION OF CONVENTIONAL DESIGN OR SITE PREPARATION	CONFLICT: REQUIRES SPECIAL DESIGN OR SITE PREPARATION	CRITICAL CONFLICT: MAY BE PROHIBITIVE EVEN WITH SPECIAL DESIGN OR SITE PREPARATION
Present and Future Efficiency of Development	Is the proposed site development compatible with existing and future land uses?	Use of Land: 1970 Regional Plan Municipal Master Plan State Proposed Plan of Conservation and Development			
Determination of Best Land Use	Is the land being put to the best use relative to existing or potential resources?	Entire Resource Inventory			

GUIDE SHEET # 30

RESOURCE DATA MATRIX I

SINGLE-FACTOR MAPS	BASIC DATA MAPS	Topographic Map	Geology: Bedrock Map	Geology: Surficial Map	Soils: Soil Survey Map	Hydrology: Water Resources Inventory	Land Use and Zoning	Other Sources of Data Not in Map Form
Orthophoto								•
Topography		•						
Landforms		•						
Slope		•			•			•
Bedrock Map			•					
Bedrock Type and Structure			•					•
Depth to Bedrock			•	•	•	•		•
Surficial Geology				•				
Unconsolidated Materials				•				•
Aggregate Survey								•
Detailed Soils Map					•			
Natural Soil Groups					•			
Soils Saturated Within 3' of Surface 1-2 Months			•		•			
Soils Saturated Within 3' of Surface 2-12 Months					•			
Percolation Rate Classes of Soils					•			
Drainage Areas		•				•		
Floodprone Areas		•				•		•
Depth to Water Table						•		•
Availability of Ground Water				•		•		
Wetlands - Tidal and Inland		•			•	•		•
Streambelt		•			•			
Channel Encroachment and Floodplain Delineation								•
*Major Open Spaces								•
Existing Sanitary and Water Related Facilities						•	•	
Existing and Potential Water Supply Watersheds			•			•		
Use of Land: 1970							•	
Vistas and Views		•						•
Town or Regional Master Plan								•
Zoning							•	
On-Site Data								•
Reports, Plans, Etc.								•

*Major Spaces Map - State Park, State Forest, Fishing and Hunting Access (State Holding or Lease)

Source: Natural Resource Center, Connecticut Department of Environmental Protection

GUIDE SHEET # 31

RESOURCE DATA MATRIX III

SUMMARY OF RESOURCE INFORMATION NEEDED IN SUBDIVISION EVALUATION CHARTS

RESOURCE INFORMATION	1 Expansion of Sewer and/or Water Services	2 On-Site Water Supply	3 On-Site Septic System	4 Site Development	5 Road Network	6 Hazards and Nuisances, Natural and Man Induced	7 Resource Protection	8 Services to Support Development	9 Compatibility of Surrounding Land Uses
Orthophoto	o		o	o	x	o	x		
Topography	x		o	x	xx	x	x		
Landforms	o		o	x			x		
Slope	x		xx	xx	xx	x			
Bedrock Map	o		o	x	o				
Bedrock Type and Structure	o	x	o		o	x			
Depth to Bedrock	x	x	xx	x	x				
Surficial Geology	o		o	o	o				
Unconsolidated Materials	x		o	xx	x				
Aggregate Survey							xx		
Detailed Soils Map							x		
Natural Soil Groups	x		x	xx	x				
Soils Saturated Within 3' of Surface 1-2 Months	x		x	x	x				
Soils Saturated Within 3' of Surface 2-12 Months	x		xx	x	x				
Percolation Rate Classes of Soils			x						
Drainage Areas				x	x	x			
Floodprone Areas			xx	xx	x	xx	o		
Depth to Water Table	x		xx	xx	x				
Availability of Ground Water		xx	x				xx		
Wetlands - Tidal and Inland	x		x	xx	xx	o	xx		
Streambelt			o	x		o	xx		
Channel Encroachment and Floodplain Delineation			x	xx	xx	xx			
*Major Open Spaces							xx		
Existing Sanitary and Water Related Facilities	xx	xx	x						
Existing and Potential Water Supply Watersheds	x		x				xx		
Use of Land: 1970		x			o	xx	x		
Vistas and Views							xx		
Regional or Town Master Plan	x		x				x	xx	
Zoning		o				o		x	
On-Site Data	x	xx	xx	xx	xx	xx	xx		
Reports, Plans, Etc.	xx	o	o	x	x	xx	x	xx	

*Major Spaces Map - State Park, State Forest, Fishing and Hunting Access (State Holding or Lease)

xx - Most important resource information to consider
x - Important resource information to consider
o - Supplemental resource information to consider

SOURCE: Natural Resource Center, Connecticut Department of Environmental Protection

Audio Tape Script

SYNTHESIS SCRIPT

Voice 1; Planning and design are not magical processes. A planner does not mix all of a town's ingredients in a caldron, stir them around and pour out a well organized, functioning community. It just doesn't work that way. The only aspect of that description that is accurate is that the final product is a combination of all the parts of a town. In the other units, we have looked closely at these discrete parts. We looked at the people, the primary uses of the land, and population studies. We looked closely at the natural systems: geosystems, hydrosystems, uplands, and wetlands. We discussed characteristics and their sensitivities to change and development. Then, we looked at man-made systems that are placed upon the land and we talked about how we can begin to evaluate the impact of these systems.

Now it is time to take these parts, the ingredients of the "land use planning process" and develop a logical method for making informed land use decisions. Each unit in the land use decision making kit has approached the study of the components with logic, reason, and a critical eye. This approach should be continued in the final integration of information which we call the synthesis process.

Rob Pressman, a professional landscape architect, has agreed to join us for the synthesis unit. His point of view on the problems and prospects of planning a sound environment for people and their institutions is based upon practical experience.

As Rob Pressman discusses the planning process, you should be aware of the fact that he is discussing a generalized approach. The concepts and procedures are generally accepted. However, local and state laws do have a bearing on the process and it may be necessary for you to modify the approach to meet the requirements of your community.

We appreciate Rob Pressman's willingness to help pull all of the pieces of the land use decision making process together in the synthesis unit. We will now turn the balance of the unit over to him...

Thank you. It is a pleasure to be with you.

Voice 2: Today, the environmental consciousness of people is growing. As a result, planning has to be responsive to a broad range of issues. The days of the design scratched out on the back of an envelope are long gone. Planning and design is no longer a one shot deal. How much freedom can, or should a designer have when he is responsible to thousands of people? How much freedom can the designer exercise when he must consider the values of diverse public interest groups each pursuing their own needs? There are the corporate developers who seek maximum profits. There are the local town planning boards who want to maintain balanced growth. There are the environmental protection agencies and conservation groups interested in maintaining environmenal quality, and other local citizen groups who wish to maintain the status quo! The planner and designer are confronted with these conflicting interests. They must be able to avoid bias and attempt to promote the common good. To do this they are obligated to perform a systematic, thorough analysis of available information. This approach closely approximates an objective decision-making process. There have been a number of synthesizing methods developed over the recent years, many involving computers. The computer, as a tool, has tremendous possibilities because of its ability to store large quantities of data and perform a multitude of operations

in a very short period of time. The wide scale application of computer technology to land use decision making is far in the future and will not help those towns that presently are in need of planning studies and cannot afford the comforts of a computer. So we will begin to discuss a synthesis technique that can adequately be done by hand as well as by the computer.

Performing any synthesis operation requires extensive note-taking and recording. As we discussed in the cultural unit, people interested in planning should become comfortable with a pen or pencil and should lose their self-consciousness about their ability to draw. You do not have to be an artist to record the kinds of information that we are dealing with. In the cultural unit, we discussed many recording techniques. If you are not familiar with these techniques return to those guide sheets in the Cultural Unit which discuss recording techniques.

There are two alternatives in this unit: You may follow along as we outline the synthesis process or you may use all the data you have accumulated about your town or a site in your town in the synthesis process. This second alternative will take longer but can be more rewarding. There is a greater likelihood that you will understand the synthesis process if you participate in it. Now let's begin with the basic synthesis concepts.

Turn to Guide Sheet #2. Here on Guide Sheet #2, you can see how the synthesis process functions in land use decision making. Essentially, the synthesis process integrates the needs G.S. of a population, the requirements of natural systems, and the nature of the land. (Pause)

If "land use planning" is the planning or locating of uses on the land, then our primary concerns are with the land and the land uses. With the land we are interested in preserving and respecting its ecological integrity. In the natural systems units we learned of the land's vulnerabilities to disruption by development. Planning methodologies in the past that have not considered these vulnerabilites have often been responsible for the erosion of topsoil, mudslides, contaminated water supplies, dying lakes and streams, and flooding. Here we are discussing a methodology that avoids these severe environmental impacts. The approach to the land then, is to consider what "should not be". In other words, where are the areas that should not be developed due to their vulnerability to environmental disruption. Areas of high potential environmental impact or disruption are unbuildable areas. "Buildability" is another term used to describe this concept of land vulnerability. It means just what it says: buildability refers to the ability to build in a certain place.

When we talk about the "land uses" and their location we take the opposite viewpoint and consider "what should be". Land uses have intrinsic needs for survival, they each have certain requirements on which they thrive. In other words, land uses should be in certain places because of their specific needs. We use the term "attractiveness" to describe these supportive characteristics of a land use.

Our synthesis process is based upon these two concepts: environmental impact which we call buildability and land use attractiveness. If you were able, in your town, to eliminate from con-

sideration for future development all of the areas that were unbuildable due to the high potential of environmental impact, and to pick out , from the remaining land, those areas where different land uses would be most"attractive", you would have the makings of a viable, ecologically sound development plan.

The graphic technique we use to synthesize or integrate information on buildability and attractiveness is called an "overlay" technique. Refer to guide sheet #3 as we discuss how this method works. G.S.. #3-

The overlay technique allows us to examine the inter relationships that exist among various kinds of data categories. This technique for exploring the interrelationships of various pieces of data for a given land area has become an important tool for planning projects at all levels.

The process is relatively simple. Information on a single specific aspect of the land is transferred from a map to a clear sheet of acetate. In guide sheet #3, we might assume data type #1 to be slope... on transparency #1 we might use a color or symbol to indicate all areas exceeding a slope of 15% for example. Data type #2 could be information on wetland soil types... The information is transferred from a soils map to the acetate, by outlining the wetland soils areas and marking them with special symbols or a special color. The same process is carried out for data type #3 which may, for example, designate areas with depth to bedrock of less than 3 feet... Now, if the data on each separate data factor has been drawn on a separate sheet of acetate and they are all at the same scale, we can overlay the acetates.. and study the interactions.

On guide sheet #3, we see that it is possible to combine information on slope and wetland soils, by overlapping acetates #1 and #2... likewise, we can combine information on wetland soils and depth to bedrock by overlapping acetates #2 and #3..: if we are interested in combining information on all three data types, we can overlay transparencies #1,2, and 3.

Overlaying the transparencies on top of one another enables us to "look through" the data. We can begin to pick out where there are overlaps and conflicts.

In the diagram on guide sheet #3 we used different symbols for different data categories. Using different colors for different data categories will achieve the same goal. Because each piece of information is recorded on a separate sheet of acetate and is isolated from all others, any two or more categories can be overlayed and examined. The flexibility of the method is consistent with the underlying principle of inter-relatedness of the environment and its parts, with man-made systems.

Ultimately, we plan to overlay an environmental impact map with a land use attractiveness map to yield a "land use allocation" map. The land use allocation map will make recommendations for future land use distribution. But first we must generate an environmental impact map and a land use atractiveness map.

Let's begin with the environmental impact composite map. This map will indicate those areas that are highly vulnerable to development. We must pick out those development aspects that might

have an impact on the land, determine what those impacts might be and what environmental conditions will contribute to or are most susceptible to, destruction. For example, a building requires a foundation of some sort to support it. There are certain physical requirements for foundations which cannot be met in some areas, such as wetlands, without extensive modification of the land. To build in a wetland would require a fill operation which would destroy the wetland. Therefore we can say that a building would have a severe impact on a wetland areas. Almost all wetlands can be recorded as unsuitable areas for building. We will proceed with this type of evaluation for many buildability issues.

Septic tanks and leaching fields are common buildability considerations. These waste disposal techniques are utilized in towns or areas where municipal sewage collection treatment systems are not provided. Septic systems are on-site systems, consisting of an underground septic tank that collects sewage and finger-like pipes, called the leaching field, that disperse the sewage effluent throughout the soil. On guide sheet #5, you will find a sketch of a septic system. The principle behind the system is quite simple. As effluent from the septic system moves through the soil, it will be acted on by bacteria and micro-organisms and will eventually become harmless. The efficiency of this method is dependent upon a great many factors which are outlined in detail in the geosystems unit. The potential danger involved is that under improper conditions, untreated effluent can reach the water table and contaminate the ground water. Another possible impact of an improperly designed or installed on-site septic system is the emergence of the raw effluent from the soil. G.S.

The primary factors that influence the functioning of a septic system is the absorption capacity of the soil and depth to bedrock or hardpan. The rate of infiltration of sewage effluent into the soil must be adequate - the standard rule of thumb indicates a percolation rate of greater than 1" per hour, in most cases, will preclude the possibility of unsanitary surface conditions. Percolation tests give us a measure of the permeability of the soil and allow us to determine the suitability of a particular soil series for on-site sewage treatment. On guide sheet #6, there is a summary of the procedure for performing a percolation test. If you did not complete Geosystem A-T Unit, stop the recorder and read guide sheet #6. (Pause) Soils with suitable percolation rates for septic systems can be found by using the Soil Conservation Service Soil Survey Map and the Percolation Rate Key for the map. G.S.

The reading of soil maps and keys is covered in the Geosystems Unit. Determinations of where septic systems can be utilized for on-site sewage treatment can not be based upon a single factor analysis. Several factors must be considered.. a septic tank suitability review can be found at the top of guide sheet #7. A series of overlays can be developed for each factor and the overlay techniques can be used in determining which land areas are appropriate or inappropriate for septic systems. G.S.

Ground-water level, during the wettest season, should be at least 4 feet below the bottom of

subsurface-tile trench. This is true for hardpan soil and bedrock as well. Therefore there must be a minimum of 4 feet of well-drained soil below the tile field to ensure adequate treatment.

Slopes in excess of 15% are unsuitable for tile fields and seepage beds. Leaching fields are not only difficult and costly to lay out and construct in areas with greater than 15% slope, but lateral seepage is likely to occur resulting in the suracing of sewage effleuent down-slope.

Another unsuitable site for a septic system is land within 50 feet of a stream or other water body. The fifty foot buffer zone prevents possible contamination of the body of water with sewage effluent. Septic systems should never be installed on a flood plain.

Now that we have reviewed the requirements for septic tank suitability we can begin to produce a septic system suitability map. On this map we will outline all of the areas in our town or site that fall into any one of the unsuitable categories that we have described.

On guide sheet #8 there is a graphic representation of a map of unsuitable areas for septic systems. If you are working with your data for your town, place an acetate sheet over the soils map for your town. Using the keys in the geosystems unit color each of the soil phases that are unsuitable based on percolation rate, depth to bedrock, depth to watertable and slope. Turn the recorder off while you make your single factor transparencies. The composite of the finished acetates will indicate areas which are unsuitable for septic systems. (Pause) G.S. #8

A second buildability issue is "erosion susceptibility" or the potential of an area to erode when it is developed. Another term used to describe erosion potential is "erodibility".

Erosion was discussed in the geosystems unit in detail. But let us refresh our memory.

When rain falls, or water from any source runs downhill on bare soil, it moves soil particles, organic matter, and soluble nutrients. This process is called erosion. To avoid erosion, the soil must be protected from moving water. Dense vegetative cover will intercept rain and slow water runoff, thereby providing the best natural deterrent to erosion.

The possible impacts of erosion are numerous. Bottom-land farmers are concerned with erosion on the uplands because soil may wash down and cover their crops. Infertile materials may be deposited on their good land and impair the drainage of their fields.

Silt from erosion often chokes streams and fills reservoirs; it pollutes water supplies and depletes storage; it destroys wildlife and recreational areas. The deposition of soil where it is not wanted may be as damaging as its removal from its original position.

New development is a major contributor to soil erosion. Usually during construction the only natural defense against erosion - vegetation - is stripped away. Each year more than 2 million acres of land in the United States are converted from agricultural use to urban use. Studies show that rates of erosion on land going into use for highways, houses, and commerce is about 10 times greater than the erosion rate of land in cultivated row crops; 200 times greater than on land in pasture; and 2,000 times greater than on land in timber.

Why is there so much erosion associated with development activities? Well, first of all,

large earth moving equipment has made the reshaping of the land easier and faster and has brought steeper and rougher land into use. These steeper lands have high erodibility and as soon as vegetation is cleared, severe erosion occurs with the first rain. The trend toward large subdivisions and developments has left cleared and graded areas exposed to erosion for a long time. To facilitate the movement of large earth movers and to cut costs, developers frequently have all existing vegetation stripped away during construction. Eventually seedlings and sparse ground cover are planted, but initially, they provide little if any protection against erosion. Even after construction, rapid runoff from impervious surfaces - sidewalks, parking lots, courtyards, and compacted soil - causes extensive erosion damage in erodible areas.

There are measures that can be taken during construction that reduce erosion potential. These are outlined on guide sheet #13 of the geosystems unit and in the Soil Conservation Service pamphlet entitled Soil Erosion. On guide sheet #9, you will find a list of the natural factors that are directly related to erosion. G.S.

The primary natural factors are soil type, vegetative cover and slope. There are certain soils which are more susceptible to erosion. The Soil Conservation Service (SCS) has classified soils as to their erosion potential in their description of the engineering uses of soils in the published soil survey. Soils with severe erodibility can be first recorded on your erosion map. Transfer this information to an acetate sheet overlayed on your town soils map. If you are not working with your town data, there is a graphic representation of an erosion map on guide sheet #10. (Pause) G.S.

Slope is a consideration usually included in the S.C.S. Classifications but to emphasize the point, let us repeat that steep slopes have greater erodibility. Areas with extreme slope conditions, greater than 25% can be recorded on your map. Finally, vegetation as we have noted is a front-line defense against erosion. An area with dense, well-developed vegetative cover impedes run-off and holds soil in place. Slopes where vegetation hasn't taken hold or any area that has recently been disturbed, such as logging areas, are highly susceptible to erosion and can be recorded on the map. (Pause)

Foundation suitability is still another obvious buildability issue. Buildings need foundations and foundations need suitable conditions. We must admit that building technology is sophisticated enough to be able to meet the demands of any site or circumstance. Costs incurred in overcoming unusual conditions tend to be technologies limiting factor. My recommendation then is to exclude those areas where unreasonable costs would be incurred in construction as well as areas sensitive to development activities. Inappropriate foundation conditions can result in instability and are associated with the collapse of buildings, cracking walls, or sliding or settling of the entire site. Also unsanitary conditions of wet basements can result from unsuitable conditions.

Criteria used to determine suitability for building foundations includes slope, soil characteristics, depth to bedrock and water table. These are outlined on guide sheet #11, a revfew of G.S.

foundation suitability.

Concerning slope conditions, we encounter moderate foundation limitations at 15% and severe limitations on slopes greater than 25%. This includes economic as well as structural considerations. Slope and soils are inter-related. The bearing capacity and consolidation characteristics of the soil must be considered to avoid areas with collapse or sliding potential. Depth to water table is particularly significant in considering foundations where basements are involved. To eliminate potential flooding, special design or site preparation, the water table should be of a depth greater than 10 feet, in construction involving basements.

Depth to bedrock is essentially an issue that affects construction costs. Shallow bedrock involves blasting and excavation work which is costly and time consuming. If the bedrock lies at a depth greater than 10 feet, construction problems will be avoided for most types of foundations.

Refer now to guide sheet #12 for a graphic map of foundation suitability. If you are working with your town data, outline foundation suitability areas on a clear acetate sheet placed over your town map. (Pause) G.S. #12

Now let us move on to study the issue of flooding. Prior to man there were floods but limited flood problems. There was no one around to be bothered by floods. There was no damage to property or to human life. Flood problems began with the construction of the first structure in a flood-plain area at a level below flood heights. Other developments followed. As agricultural, residential, commercial and industrial use of the flood plains grew, the personal and economic losses from floods multiplied as well. Man has tried with large-scale works, such as reservoirs, flood walls and levees, to prevent or reduce the natural extent of flood inundation but this effort has only been partially effective. Each year, flood losses exceed $1 billion, not including the loss of life.

Flood control is a natural function served by flood plains, stream channels, wetlands and natural retention basins. Please refer to the Inland Wetlands and Hydrosystems A-T units to gain a greater understanding and appreciation of these natural systems. (Pause)

With a better understanding of the functions of these systems, we should be able to recognize why man should not tamper with them and should exclude them from development. Increasingly, planners are accepting the 50 year flood plain as that area from which all development should be excluded, except for functions which are unharmed by flooding or for uses that are inseparable from flood plains. Guide sheet #13 has a review of flood plain construction considerations. G.S. #13 Uses that are unharmed by flooding include: agriculture, forestry and open space. Land uses that are inseparable from flood plains are marinas, water-related industry and water using industry.

In land use planning considerations, we can see that flood plains and wetlands are generally unsuitable for development. The impacts on the environment, and the impacts on man as a result of development in these areas are severe enough to warrant designating these areas as unbuild-

able zones on our buildability maps. Guide sheet #14 has a graphic representation of a map of flood potential. Based on your town data, create an acetate overlay indicating areas of flood potential. G.S.

Ground water is our next environmental impact issue. Here we are conterned with two issues... water quality and ground water recharge. Hydrosystems are fully examined in the Hydrosystems unit, but we will review the major concepts and discuss how they relate to urbanization.

As rain falls and is absorbed into the soil, it replaces water that has evaporated or it is used by plants. After the needs of the plants and soil are satisfied, the excess water reaches a zone of saturation where all of the openings in the rock and soil are filled with water. This zone is called "ground water". Ground water flows, but very slowly. Thus, groundwater is able to be tapped by wells for drinking water, or emerge as springs, or seep into a stream miles from its point of entry into the ground. In most streams, the water that flows during dry spells is largely ground water. These last points are important in terms of human impacts. If ground water becomes polluted, then man's drinking water is contaminated and surrounding streams will be polluted as well.

The question then is how does ground water become polluted? One way is through the improper siting and/or installation of a septic/leaching system. A second way in which ground water becomes polluted involves aquifer recharge areas that replenish the supply of groundwater in aquifers. An aquifer is a large water bearing layer of rock, gravel, or sand. An aquifer recharge area is, as the name implies, the point of interchange between surface water and aquifers. It is the movement of ground water to surface water that contributes water to rivers and streams in periods of low flow. Obviously, these points of interchange are also locations where a polluted river may contaminate the pure water resources in the aquifers. These recharge areas are critical for the management and protection of ground water. Many areas without municipal water supply rely on ground water to obtain water in their wells. On guide sheet #15, you will find a list of factors which might have severe impact on ground water quality. - depth to water table and aquifer recharge areas. Areas with shallow water table should be recorded as unsuitable for septic tank systems. These areas should already be marked on the septic system suitability map. Aquifer recharge areas should also be recorded as unsuitable for many forms of development. Land uses such as agriculture, forestry, recreation and low density development pose no danger while industry and urbanization in general do. Refer now to guide sheet #16 for a stylized map of areas that, if developed, will potentially lead to contamination of ground water. (Pause) G.S. G.S.

We now come to two issues which are somewhat different than the previous ones - vegetation and wildlife. Both are environmental features that are very sensitive to development yet have little impact on the land uses themselves in the way that flooding and erosion do. Vegetation and wildlife can be destroyed, much to the detriment of environmental quality. But they can't strike back. On the other hand, a flood plain that has been extensively developed will have its

revenge when a 50 year flood demolishes everything in its path.

Vegetation plays a good many roles in our environment. Besides providing infinite beauty in the landscape, it serves as an erosion deterent, wildlife habitat, oxygen producer and air purifier, shade-maker and playground. Yet, as urbanization approaches, it is the first thing to go. Up until this time it was considered economically viable to clear the land of any existing vegetation, save nothing, and replant after construction. Finally, today, it is becoming increasingly clear to developers that trees and shrubs have tremendous economic value and are worth saving. This value is apparent in the types of development that people prefer to live in these days.* People are demanding that their living and working environments abound with vegetation. Developers must respond to this demand. Ultimately they find that their profits are greater when vegetation is protected because people are willing to pay for the lush surroundings. A review of vegetation considerations is presented on guide sheet #17. G.S. #17

So with the importance of vegetation increasing, we might choose to make a map of vegetation as graphically illustrated on the left hand side of guide sheet #19. (Pause) Vegetation that is significant or special in some way, should be preserved. These areas should be recorded on a map and be considered as zones that are unsuitable for most development, recreation probably being the only exception. G.S. #19

Wildlife plays an even less obvious role in environmental quality. But, just as our interest in and concerns for vegetation are growing, our wildlife consciousness is expanding as well. Talk of endangered species has become quite common and the numbers of bird watchers increases every year.

Wildlife habitats differ, obviously, for each different type of animal. Streams and lakes, we know, house various fish species. Ducks, beaver, muskrats and otter live along streams as well as in other wet areas. Deer, skunks, woodchucks, chipmunks, squirrels, fox, rabbits, grouse and many other animals can be found in uplands and open space areas. Birds often prefer edge conditions - along waterways, roads or forest. It is difficult to make generalizations about specific habitat preferences. Each community will have different wildlife with different habitats. Guide sheet #18 reviews wildlife considerations. You may already be familiar with wildlife habitats in your town. If not, begin to make inquiries about important wildlife areas or go out and discover what's out there for yourself. Once you find out, you can map out important habitats as is illustrated on the right hand side of guide sheet #19. Once you have located and marked these areas on your map, take action to prevent them from being destroyed by future development. G.S. #18 G.S. #19

Now that we have discussed and generated separate maps concerning development suitability, we can "synthesize" our information and derive a composite map that will include all of the data that we have previously recorded. Each "single factor map" contains areas which we have determined to be unsuitable for development. Since we have only recorded severe conditions, our composite

map will show us all areas in our town which should not be considered at all for development. Each category must be considered as having equal importance in the decision making process. The overlays we have developed are placed on top of one another. Make sure that they all line up properly on the base map. Now, take a clean piece of acetate, place it on top of the stack, and trace off the sum total of all the areas marked on the single-factor maps. This final map is your composite building suitability-environmental impact map. When placed on the base map of your town or site, it will delineate those areas that are unbuildable, for one reason or another. Refer to the guide sheet #20 for an illustration of the preparation of a buildability composite. G.S.

We chose to only record severe conditions for illustrative purposes. Actual planning studies would not only record severe limitations, but would break down the data into other categories and record them as well. For example, we said that septic tank systems were unsuitable in areas with a percolation rate of less than 1" per hour; with less than 4 feet of soil beneath the tile trench; and on slopes in excess of 15%. We could approach the issue of septic systems from the other end and describe those areas where the system would be <u>most</u> suitable. And then, of course, there are characteristics that describe areas where it is <u>moderately</u> suitable. These categories would be included in a professional study. Each single-factor map would have three colors or symbols on it, representing the suitable, moderatley suitable, and unsuitable zones.

When it comes time to do the composite map and all of the maps are overlayed, it becomes very difficult to interpret the results if varying levels of suitability are included. This is why we dealt only with severe limitations condition. Now you can probably better understand why the computer is becoming a very valuable tool in land use planning. It has the capacity to make the subtle distinctions that our eyes have difficulty making. On guide sheet #21, we have re- G.S.
produced a copy of a septic tank suitability map produced by a computer.

Instead of drawing maps by hand, the computer can analyze data in its memory and print out single factor or composite suitability maps. Stop the recorder while you study the computer generated maps on guide sheets #21 and #22. G. S.

Presently, there is federal legislation being drafted to create a National Land Use Bank that would store environmental information for all parts of the United States in one computer center. As development occurred anywhere in the country, the data would be punched in and the bank would be continuously updated. The accumulation of data for this sophisticated system will take an extended period of time. However, once it is completed, environmental impact statements on any parcel of land in the country could be assembled rather quickly.

Voice #1: Thank you, Mr. Pressman for taking the time to review the buildability issues of the synthesis process. We look forward to joining you in Part II of the synthesis unit which deals with the issue of attractiveness. Before we continue with Mr. Pressman, I would like to review the preparation of the final buildability composite. We have prepared three overlays from which you can construct a buildability composite for a sample site. Turn off the recorder while you work on the activity on guide sheet #23. G. S. #23

Now that you are thoroughly versed in the principles of the synthesis process, it is important to move from theory and principle to a practical analysis that can be performed with this technique. In the final part of this unit, we will concern ourselves with two applications of the synthesis process - evaluation of a site plan for a subdivision or planned unit development and the siting of a sanitary landfill.

Let's begin with the evaluation of the site plan for a subdivision or planned unit development. The Natural Resources Center of the Department of Environmental Protection has developed an analysis for this situation by outlining a comprehensive set of questions that aid us in evaluating natural resource considerations. These questions are listed in guide sheet #28. (Pause) The questions are a detailed form of the buildability analysis that we completed with Mr. Pressman. Stop the recorder while you read through the questions. (Pause) G. S. #28

Welcome back! I am sure by now you are thinking there are a lot of questions without many answers. On guide sheet #29, the questions about subdivisions are expanded into a matrix that includes the questions, the conditions to evaluate and the resource information needed for evaluation. On the right hand side of the matrix, there are columns which contain criteria for evaluation. These criteria are broken down into three categories: normal considerations, conflict - requires special design or site preparation, and critical conflict. In a critical conflict situation, a problem may be prohibitive even with special design or site preparation. In these columns, the reason for the evaluation is provided. The caption at the top of the right hand side, states that the criteria for evaluation require data based on maps, reports, or on-site inspection. G. S. #29

In order to locate the information on the appropriate map, the Natural Resource Center has prepared two other matrices. These may be found on guide sheets #30 and #31 The matrices cross match standard types of maps with types of information needed for the evaluation. G. S. #30 G. S. #31

Probably at this point you are overwhelmed by matrices and questions...this is not unusual. Slowly start on the first page of guide sheet #29. Work your way through one question at a time. Each time you need a piece of information proceed to the resource information chart to locate which map contains the needed information. Continue in the same manner through each question on guide sheet #29. When you are finished you will have a solid knowledge of the natural resource consideration in evaluating a subdivision. Turn the tape recorder off while you work. (Pause)

Now that you have had some experience in natural resource considerations for subdivisions,

it is time for us to turn out attention to siting a sanitary landfill. Locate the pamphlet entitled Use of Natural Resource Data in Land and Water Planning in your land use decision making kit. This report was written by David Hill and Hugo Thomas, two respected planners. In the pamphlet, Hill and Thomas carefully outline the synthesis/buildability process for locating a landfill. They follow the same process that we have - a description of basic resource data, compilation of available data, a resource interpretation system and finally the collating of the single factor maps into a composite. Stop the tape recorder while you read the bulletin. Turn the tape recorder on again when you are finished.

It is important to ask one final question: Who will assemble and analyze the resource data to present the options to citizen decision makers? It is a difficult question. A partial answer can be gained from the pamphlet The Environmental Review Team - Evaluation of Land Use Proposals. This pamphlet is in your land use decision making kit. As you can see the synthesis process includes many considerations. By careful work and planning we can make provision for an expanding population and economy, while maintaining the integrity of the environment.